OCT 27 1924

Founded March 1, 1874—Fifty Years of Service

Electrical World

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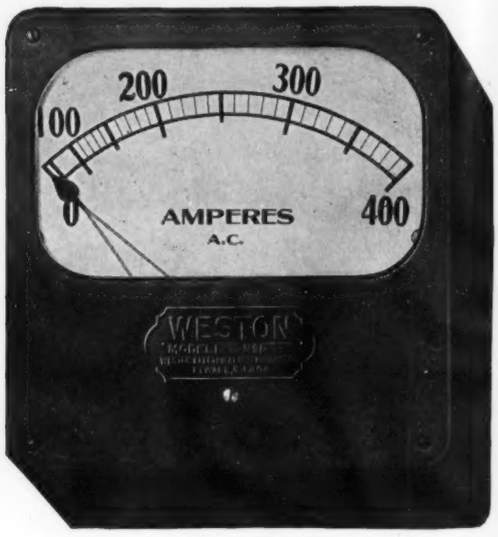

Engineers and designers prefer to buy equipment on performance records—they then know what to expect and guess work is eliminated.

Recently a purchaser returned a Model 1 Weston Instrument, still in good working order, which had been in continuous service for more than 25 years. This is typical of Weston dependability and performance. This purchaser, having received 25 full years of service was so satisfied that he ordered another instrument and made us a present of the old one for exhibition purposes.

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Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

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W. H. ONKEN, JR. Editor — HAROLD V. BOZELL Editor

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Forty-five Years of Electric Incandescent Lighting

TUESDAY last marked the forty-fifth anniversary of the electric incandescent lamp. Invented October 21, 1879, at Menlo Park, N. J., by Edison, the three basic features of the lamp have been incorporated in all subsequent lamps, and except for contour and filament the electric incandescent lamp has not undergone much change. However, the efficiency of the original lamp approximated one lumen per watt throughout its average life, whereas the efficiency of the electric incandescent lamp of today is of the order of nine lumens per watt for the vacuum type and fourteen lumens per watt for the gas-filled type. The price of the lamp has also undergone considerable change, the tungsten incandescent lamp today selling for one-third less than its pre-war price. On a candlepower basis the difference is considerably greater. While the original lamp gave about 10 candlepower throughout its life and sold for $1.25, for 27 cents one now obtains an electric incandescent lamp giving an average of 45 candlepower throughout its life, which is almost twice that of the older lamp. The excellence of the present electric incandescent lamp with its filament of tungsten is shown by the rapidity with which it has outdistanced all its competitors. With the exception of the magnetite-arc lamp and the vapor lamp, no other type of electric lamp has been able to survive, and for general purposes of illumination today the electric incandescent lamp stands supreme. This certainly is a tribute to the genius of American lamp manufacturers. Spurred on by a desire to excel and by the exacting requirements of electric light and power companies, the electric incandescent lamp has been developed in the United States to the highest state of perfection and standardization, and this contribution has been made entirely by the manufacturers.

Earnings of Power Companies Unaffected by General Business Conditions

THE growth of the electric light and power industry regardless of the conditions of general business throughout the country is understandable to men in the industry but puzzling to others. Outsiders do not grasp the fact that the electrical industry is far from the saturation point and that new uses and applications constantly arise. Of course, a very severe depression has its effect in that the growth is not what it should be; but the electric public utilities have never been faced with 50 per cent or 75 per cent production. Every year the production of electricity exceeds the record set by the previous year, and this has held true for a quarter of a century.

The case of the Detroit Edison Company is typical. As is well known, automobile production centers in the Detroit district. This year the production of automobiles, however, did not come up to last year's output by 6 per cent. Nevertheless, the Detroit Edison Company, whose circuits traverse the heart of the automobile district of this country, shows a gain over last year's earnings for the nine-month period of 8 per cent and, electrically speaking, the territory is as well developed as any in this country and better by far than the average. Similar situations might be cited for other sections as well, showing why electric light and power securities are so popular.

Wanted—A Henry Ford to Make Electrical Appliances

HENRY FORD had a vision. He saw what it would mean to the people of America if it were possible for them to ride the roads in simple, economical self-propelled vehicles. Then he built a car that would run, but he was not content with that. He also built a market by making cars that were inexpensive as well as good and selling them to thousands of people until to own and drive an automobile became a fad and set a social standard. The electrical industry is waiting for a man with this kind of commercial courage who will back its great vision of complete electrical equipment in the home, first with low-priced and dependable appliances that everybody can buy easily, and then with the kind of selling that will drive domestic drudgery out of the American home—not "some day," but now.

There are 11,725,000 families connected to electric service lines in the United States today, of which but a small percentage are adequately equipped with appliances. Six million more homes lie within easy reach, but are still unwired. Every owner of one of these homes will ultimately spend as much for electrical appliances as he does for a Ford car. No one can say, therefore, that the market is not great enough to satisfy a large ambition. For we are not waiting for the public to decide to buy, but for the coming of a master market builder who will accomplish the task in the big way that has marked the astonishing evolution of the automobile industry. The American family will buy a full equipment of electrical labor-saving and comfort appliances just as readily as it has bought Ford cars, once the pleasures and benefits of "doing it electrically" have been interpreted to it as efficiently as Ford has put before it the lure of the open road.

There is nothing much the matter with electrical appliances today—large or small. They do their work well and become indispensable to every household that possesses them. The trouble lies in the fact that they are manufactured in too small volume and sold by tens where they should sell by thousands. As a result the electrical industry today is actually not equipping

homes as fast as they are being built. The industry is falling behind, not gaining on its market. It is failing to render in the fullest degree the great service to humanity of which it is so justly proud, because it is not making this benefaction popular. When will a Henry Ford rise up in the electrical industry and show how?

The Scientist Behind the Scenes

WHEN one sees an elaborate historical production in motion-picture form he is usually ready to give credit to the author, the scenario writer, the director and to a score of other people whose names are flashed on the screen before the picture begins. Rarely, however, is any thought given to the painstaking research far back in the very elements of the production, research that has made the wonderful effects both possible and inexpensive enough to bring them within the reach of the masses. W. F. Little, in the *Transactions of the Illuminating Engineering Society* for July, 1924, gives an inkling of the work involved in one phase of motion-picture work. Speaking of photographic emulsions, he says:

"The actinicity of photographic emulsions plays a very important part in the motion-picture studio as well as in other photographic problems. Spectrograms of different emulsions are made by the light from an acetylene flame through a narrow slot and projecting through lenses upon a replica diffraction grating which disperses the light into the normal spectrum. Placing a neutral wedge in front of the slot, the emulsion is exposed in varying degrees, dependent upon the density throughout the entire spectrum. The actinicity is recorded upon the emulsion for the different wave lengths of light. These tests were of invaluable assistance in securing the proper emulsion for correct brightness balance in some of the recent motion-picture productions."

One sees in this quotation at least a century of physical and chemical research harmoniously combined for a new human need. Compare the certainty of solving a problem in this manner with the slim chance of discovering by haphazard trials a new "dope" or "jigger" to do the same trick.

Good Lighting Increases Useful Work at the Expense of Useless Work

NOW that it is becoming generally recognized that adequate and proper lighting increases production in industries and elsewhere, it is sometimes suggested that this increase may be at the expense of the bodies and minds of workers. Superficially it may appear that if a worker under good lighting conditions produces 10 per cent more, he works 10 per cent harder or faster. However, this does not follow. Although good lighting has a stimulating effect, there is little likelihood that this is so great as to be harmful. Furthermore, the stimulating effect may prevent many accidents which might take place if the workers were in a less alert state of mind.

There is an angle to the situation far more important than this. For the purpose of discussion let it be assumed that the daily rate of work of an individual who is a skilled and experienced worker is more or less constant under given conditions. It is true that it varies with the hour and with the season, but this variation does not affect the present discussion. This work may be considered to consist of two components—(1) the useful work which exhibits itself in production and (2) the useless work (analogous to "frictional loss") which the individual performs without any resultant production.

Inadequate and improper lighting increases the useless work. Under such a condition the worker does not see easily. He moves himself or the object to a better position; he squints his eyes or screws his head around to avoid glare; he looks more than once before he recognizes; he cannot see as rapidly or as accurately as under good lighting; he suffers the well-known effects of glare if the lighting is bad. These are a few factors which convert muscular and nervous energy into useless work. For any reduction in this useless component there is a corresponding gain in the useful component without any increase in the total work done by the individual.

It may be asserted confidently that good lighting is not a lash which drives the worker to do more work and that the human engine is fairly well governed so that its average rate of work is more or less constant. The great opportunity of good lighting is to increase the efficiency of this human engine by decreasing the "frictional losses."

Watts per Square Foot in Residence Lighting

LIGHTING in the home is so largely a matter of providing illumination for certain limited spaces and of providing decorative light that specifications in terms of watts per square foot are nearly always inadequate or even meaningless. In fact, specifications of this sort cannot be seriously advocated by those who have intimately studied the use of light in the home. In the first place, the area of a room of a certain type—for example, the kitchen or dining room—does not vary sufficiently in most residences to be a factor as serious as the type of fixture and decorative scheme in determining the wattage of lamps necessary to provide the proper lighting.

In the dining room the primary problem is to illuminate the table, which has a small area compared with that of the room. If with a certain fixture and given wattage of lamps the table is adequately illuminated and there is a sufficient amount of general lighting, it matters little whether the room is 10 feet square or 14 feet square. Still, in the first case the watts per square foot are twice what they are in the second case. If the fixture is a simple dome, 75 watts may be sufficient, but if it is a bowl shower and the bowl contains lamps for secondary lighting, 150 watts may easily be justified. The type of shades and the character of the wall and ceiling finish are also important factors.

In the living room, the domain of portable lamps, the total wattage depends upon all these factors and also upon the number of localized areas requiring illumination. One family may need only a library lamp, but another with a living room of the same size may need several places for reading and other activities. Obviously the wattage will vary considerably. If decorative portables are included, who except the householder can say what the watts per square foot should

be? They will be determined by taste, furnishings, requirement and purse.

In a bedroom a portable lamp at the bedside serves its purpose as well in a small room as in one many times as large. This is also true of the brackets which flank the dresser or dressing table. Two brackets flanking the mirror and containing lamps of a given size fill the requirements as well in a bathroom 6 feet by 8 feet as in a room of much greater area. And so it is throughout most of the rooms of the home.

Considering that areas of rooms of a certain type do not vary greatly in most residences, and that there are other factors overwhelmingly more important, watts per square foot should be abandoned. It is such narrow views, born of a lack of intimate study of residence lighting, that are inhibiting thought and development along proper lines. Lighting fixtures and portable lamps should be sold so as to supply needs which vary markedly and to introduce charm and decorative quality. It is in this direction that proper lighting lies—and also increased revenue.

Improvements in the Electrical Show

NEW YORK'S seventeenth annual Electrical and Industrial Exposition, which closes today, has been beyond doubt the most successful ever held. It presented an even better appearance than in former years and carried with it an atmosphere of permanence and stability that was more strongly marked. Particularly gratifying were the improvements in the electrical equipment displayed. Manufacturers have happily combined in their wares increased utility and compactness with greater beauty of design, and this has naturally the desired effect upon the public mind.

A notable improvement was the partial grouping of displays of similar devices, and no doubt this arrangement will be carried further next year. It certainly would improve the appearance of the entire show and by concentration on one kind of equipment at a time visitors would carry away more lasting impressions. There are obstacles to be encountered, of course, because many manufacturers believe it most desirable to exhibit their complete lines in one place. The show, however, was a most excellent one, and with the highest number of exhibitors and largest attendance in its history the Electrical Show Company is to be congratulated.

Portable Lamps Are Popular Because They Are Shaded

THE popularity of the portable lamp provides a striking illustration of the value of shaded light. It has been accepted by the householder as a desirable lighting device and an attractive element in home furnishing. It has sold itself to the householder without effort on the part of merchandisers, and individual homes possess anywhere from one to a dozen or more. Would portable lamps enjoy their high favor if they were unshaded? Who would be foolish enough to design them without shades? Who would attempt to sell them without shades? Yet, notwithstanding this outstanding example of the popularity of a well-shaded lighting device, fixture manufacturers are turning out fixtures without any facilities for attaching shades. Dealers are selling "ball-lamp" fixtures to an unsuspecting public, and many of them show no interest in displaying or even in merchandising shades. There is now available excellent glassware in addition to textile and parchment shades which not only improve lighting and conserve vision but add much charm to fixtures. The portable lamp is leading the way in better lighting of the home. Why not absorb its lesson and popularize fixtures by means of the shades which do so much in making lighting satisfactory? Without charm and comfort artificial lighting will never attain the maximum of effectiveness and usefulness.

Corona Versus I²R Line Loss

WITH the advent of extremely high-voltage transmission lines it becomes necessary to weigh two line losses very carefully. As the voltage increases the familiar copper or resistance loss decreases, but another energy loss becomes of increasing importance. This loss, in general terms, represents the kilowatt-hours that disappear from the line between source and end and which cannot be accounted for by line resistance. Corona brushes and line transformer action of a dielectric and electromagnetic character both locally and in adjacent materials cause serious energy losses that may be greater than the direct copper loss under certain load and line conditions. In one instance in the West, for example, the total line loss was reduced by carrying a given total load on two 220-kv. circuits connected in parallel at 110 kv. as compared with the operation of one 220-kv. circuit. In times of light load or low water this type of operation may be advisable.

The exact nature and magnitude of the so-called corona losses are as yet unknown, and research is under way to get quantitative results based on voltage, conductor type and dimensions, and other factors that must be considered.

Unit Costs Misleading in Hydro-Electric Developments

THE comparative unit costs of hydro-electric plants often lead to wrong conclusions and should not be used in discussions of water-power projects. This is because no two hydro-electric developments are similar and because the only true measure of costs must consider the whole project, including the location of loads, the load factors, the total cost of firm power and the effect of variable loads and seasons. Instances may be cited where a hydro-electric development is profitable even though unit plant costs are upward of $400 per kilovolt-ampere, while under other conditions a project has been found uneconomical with unit costs about $100 per kilovolt-ampere. These differences are understood by men familiar with the business, but the general public and those unfamiliar with conditions often draw direct and erroneous conclusions from tabulations of unit plant costs. The unit cost of firm power delivered to the consumer has a real meaning, but even this cost leads to wrong conceptions when used to make comparisons. Each project is a specific development in which the only cost item of value is obtained by finding how much can be invested for each kilowatt-hour available to consumers.

First Prize in the National Better Home Lighting Contest

This replica of the $15,000 home to be given for the best essay on lighting was the central feature of New York's Electrical Show

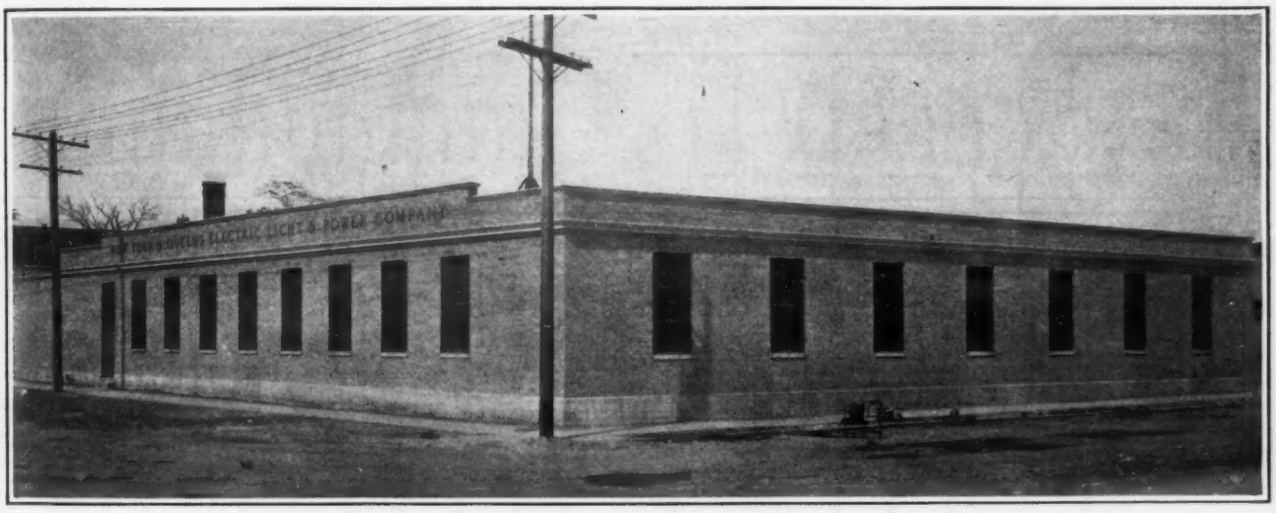
ERECTED on the main floor of the Grand Central Palace by the United Electric Light & Power Company, this reproduction of the $15,000 prize home is part of the company's contribution to the success of the Better Home-Lighting Contest. The house was formally opened when Frank W. Smith, vice-president of the United company, handed the keys to Arthur Williams, chairman of the regional committee conducting the contest.

Features of 60,000-Kva. Substation

Underground Feeders at 13,200 Volts and 26,400 Volts Supply Metropolitan Substation at Maspeth — Multiple-Voltage Transformer Banks Used — Details of Switch and Bus Structures

By J. E. GOODALE
Electrical Design Engineer New York & Queens Electric Light & Power Company

THE New York & Queens Electric Light & Power Company furnishes electric service to the Borough of Queens, one of the five boroughs making up Greater New York. In the early part of 1922 it was found that it would be necessary to provide for additional load in the Maspeth section of the territory supplied by the company. Accordingly a substation was designed, built and placed in operation before the end of 1923. It was found that the site of the old substation was not suitable for the new substation and a new site was therefore purchased. The new site was approximately 22,500 sq.ft. in area and had streets on three sides. In addition, it had the advantage of being immediately adjacent to a branch of the Long Island Railroad.



ONE-STORY SUBSTATION, BUILT ON FILLED-IN GROUND, WHICH HAS A FLOOR AREA OF 11,500 SQ.FT.

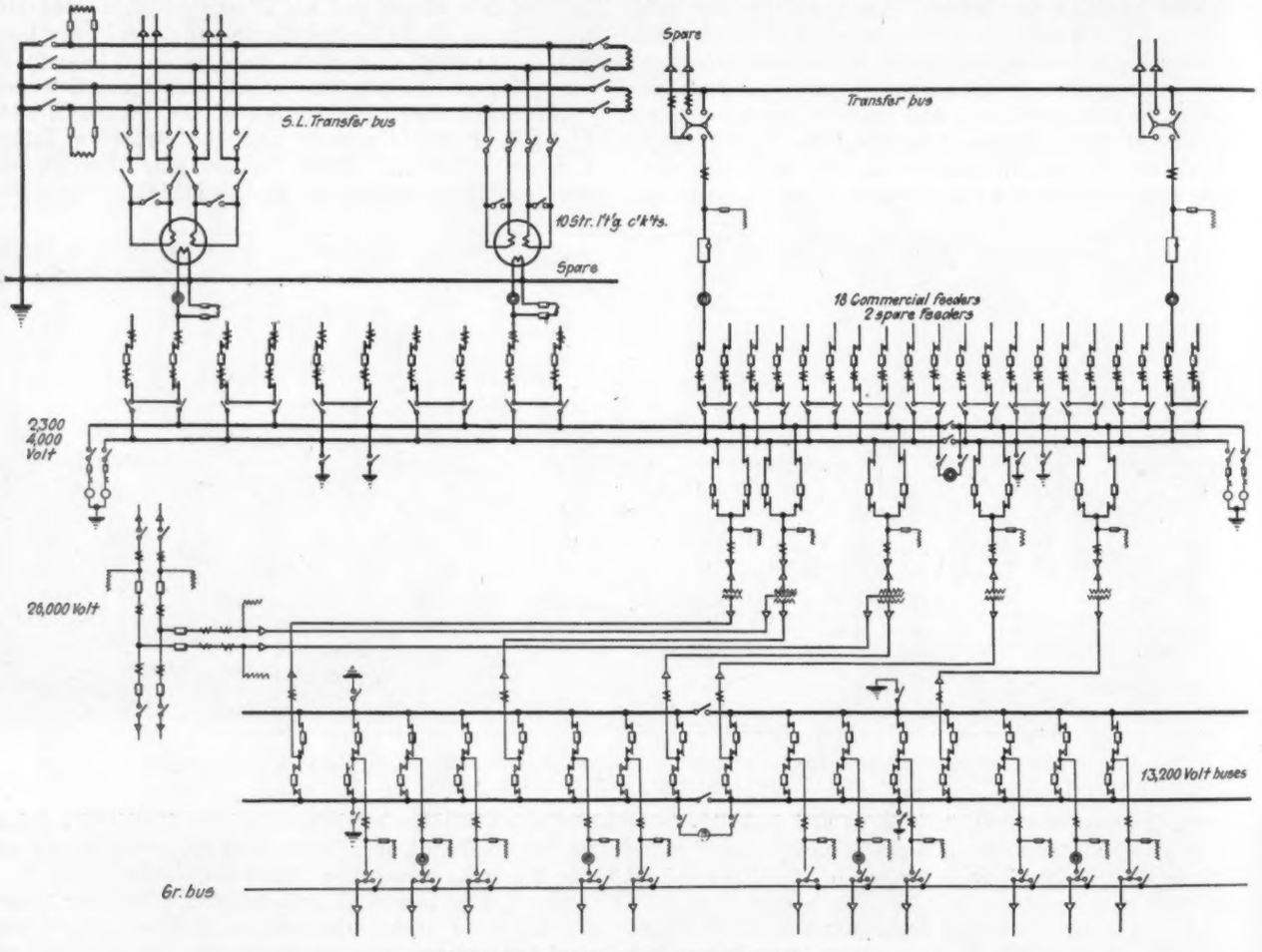
After a study of several designs it was decided that the substation should be a one-story structure. The fact that the property was below grade and that filling in was necessary lent itself to this design, because it was possible to install the necessary ducts under the substation while the fill was being placed. The building is accordingly a one-story structure built up to the building line on three sides as shown in the plan, and it has a floor area of approximately 11,500 sq.ft. This area is divided so that approximately 9,300 sq.ft. is used for switch, bus and regulator structures, and the remainder (2,200 sq.ft.) is used for the operating room, battery room, toilet and furnace room.

The substation is designed for an ultimate capacity of 60,000 kva., consisting of five 12,000-kva., three-phase transformer banks.

It is at present tied in to the Jamaica substation of the New York & Queens Electric Light & Power Company by two 13,200-volt underground feeders and to the Hamilton Street substation of the same company by two underground feeders. One of the 13,200-volt feeders to Hamilton Street has a "T" connection to the Hell Gate station of the United Electric Light & Power Company. In addition to this there is a 26,400-volt tie consisting of two 350,000-circ.mil underground feeders between the Hell Gate station of the United Electric Light & Power Company and the Brooklyn Edison Company's system. These feeders pass through outdoor switching equipment at the Maspeth substation, and taps are taken off to each of two 12,000-kva. transformer banks. These banks have three windings and step the voltage down to 13,200 and 4,000.

The indoor electrical equipment is installed in compartments of reinforced concrete. Steel forms were used in building these compartments. These forms are easily assembled and are properly drilled to take care of all necessary inserts. By the use of these forms a considerable amount of labor cost is saved and a more satisfactory and accurate result is obtained than where wooden forms are used. The 13,200-volt buses will ultimately be divided into two sections separated by disconnecting switches. There will be five feeders and two banks and six feeders and three banks, respectively, on the two sections. Reactors will be installed in the bus. These reactors will be installed on the roof and inclosed in a weatherproof structure. The roof is horizontal and is made sufficiently strong to provide for this installation. Each feeder and transformer bank has double switching on the 13,200-volt bus. The switches are truck-type and are arranged with disconnecting devices on the back so that when the truck is pulled out

of the compartment the circuit is opened. Separate disconnecting switches are accordingly unnecessary and considerable space is saved. The 4,000-volt bus is also equipped with truck-type switches with similar disconnecting devices, so that the same economy of space is gained throughout the station. The 4,000-volt bus is divided into two sections separated by disconnecting switches. At the end of each section a lightning arrester is installed. In arranging the 4,000-volt bus a further saving of space is obtained by arranging two feeders with their oil switches back to back and using only one set of disconnecting switches for bus selection for two feeders. This arrangement makes it necessary to transfer the feeders from one bus to the other in groups of two. The present transformer installation consists of two 12,000-kva. banks and one 7,500-kva. bank. The voltages, namely, 26,400, 13,200 and 4,000. The 7,500-kva. transformer has only two windings, one for 13,200 volts and one for 4,000 volts. Two oil tanks are provided in the yard and are connected by the necessary piping to all the transformers. A pump is provided and a valve arrangement is installed which makes it possible to remove the oil from any transformer into either one of the tanks and to filter the oil from one tank to the other. The transformers are all provided with temperature coils, and proper instruments are mounted in the operating room so that the operator can determine at any time the temperature of the transformers. All of the necessary cable runs between the various structures in the substation and between the structures and the transformer banks in the yard are run in fiber conduit placed under the floor. The conduit in all instances is



SINGLE-LINE DIAGRAM OF THE SUBSTATION

transformers are outdoor-type, oil-insulated and self-cooled and are placed on reinforced-concrete platforms in the yard. Because of the fact that the substation was built on filled-in ground it was necessary to build substantial foundations under the transformers to support the weight. Between the transformers, columns of reinforced concrete built on separate slabs are provided. The ducts for carrying the cables to the transformers are placed in these columns. The steel structure necessary for carrying the leads over the transformers is also supported on these columns. The columns were built on separate slabs to avoid any difficulty in case the transformer platforms settled because of the weight of the transformer bank.

The 12,000-kva. transformers are designed for three

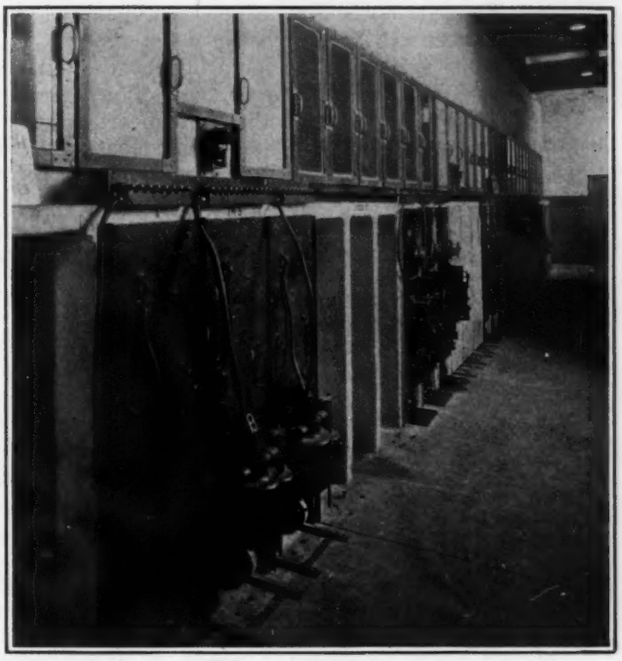
incased with a 3-in. layer of concrete. The control wires are also under the floor in iron conduits.

The outdoor switching equipment used for the 26,400-volt side of the transformers is mounted under a pipe structure erected on a concrete platform. Connections between the equipment are made by copper tubing supported on proper outdoor-type insulators. The entire structure is inclosed with wire screening mounted in removable sections.

At present the installation on the 4,000-volt bus consists of seven distribution feeders, one spare feeder and six constant-current circuits used for street lighting. The ultimate installation on this bus consists of eighteen distribution feeders, two spare feeders and ten constant-current transformer circuits. Each distribu-

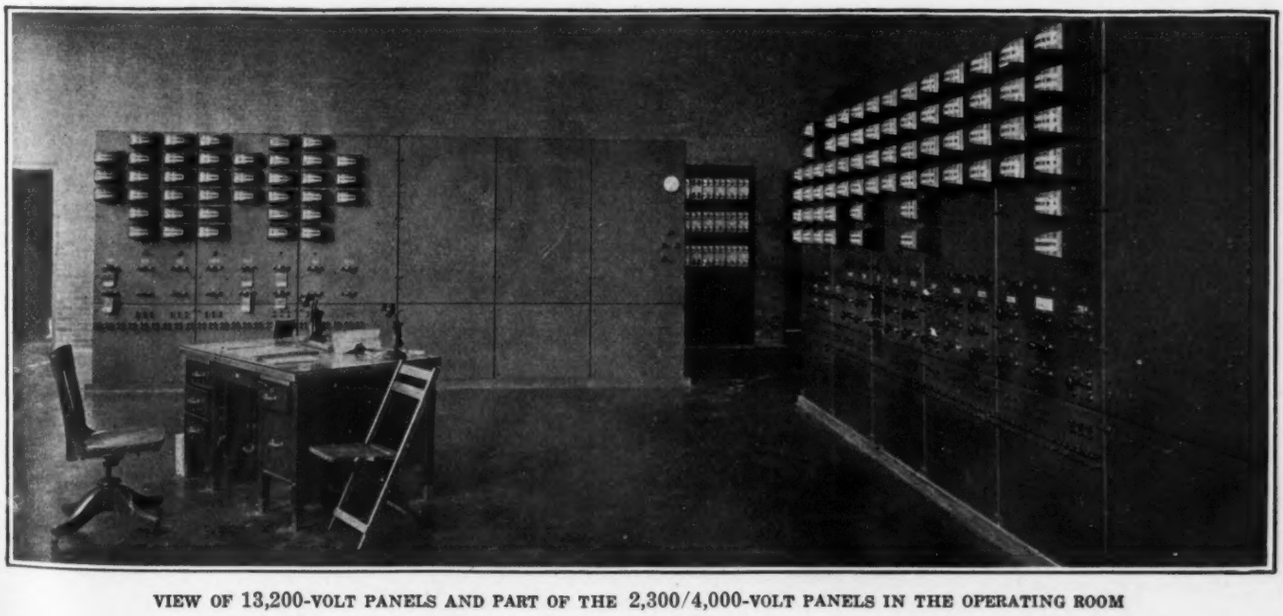
tion feeder is equipped with three single-phase induction regulators and reactors, and a transfer bus is provided to allow the transfer of any feeder to the spare set of regulators or the tying together of feeders in case of oil-switch or regulator trouble. The feeders are all designed as loop feeders with cables running to manholes on opposite sides of the substation. The feeder regulators are placed in masonry compartments back to back, using a common wall for conduit runs. A shelf above the regulators supports the reactors for each feeder. A chimney tile is provided in one corner of the reactor compartment in order to give ventilation to the regulator compartment underneath. The regulators are put on 4-in. "I" beams in a pit 4 in. deep. This pit is provided so that in case of a regulator failure the oil will be confined within the depressed area. At each end of the transfer bus a spare distribution feeder is provided. This spare feeder is equipped and connected so as to be available to take over any one of the distribution feeders whenever necessary. In this case one side of the transfer switch is used to feed the station light and power transformer banks. Two of these banks are provided.

The general arrangement of apparatus in the substation is shown in the section through the building. Doors are provided for all compartments. In order to prevent incorrect operation of disconnecting switches, pilot lights are provided where practicable, and, in addition, the doors are in many cases constructed to cover one three-phase compartment. The doors are provided with wire-glass panels where it is necessary for the operator to note the position of the equipment within the compartment. Where the doors are not provided with glass panels, they are completely covered on the back with asbestos wood, so that in case of a fire within the compartment all parts of the wooden frame will be protected. Structures are approximately 13 ft. in height, and they are so designed that the disconnecting switches may be easily reached from the floor. The oil-circuit breakers on the 13,200-volt buses are Westinghouse type "CO-I." The 4,000-volt transformer oil circuit breakers are Westinghouse type "B-5," and the 4,000-volt feeder-oil circuit breakers are Conduit type "F-11." All of these oil circuit breakers are truck-type. The 13,200-volt instrument and relay panels are erected back to back with a 3-ft. 6-in. aisle between. No terminal board is used, but the control wires are carried directly to the instrument terminals on the rear of the panel. In some cases where a large number of wires have to be carried up the back of the panel fiber conduit is used, supported a few inches from the panel. The 4,000-volt panels are placed in one line and watt-hour meter panels are placed immediately behind them.



PART OF THE 2,300/4,000-VOLT SWITCH AND BUS STRUCTURE WITH TRUCK-TYPE BREAKERS IN PLACE

The direct-current distribution panel provides for a circuit to each oil circuit breaker and is made up with porcelain cut-outs, each of which has two circuits. These porcelain cut-outs are mounted on a steel frame erected in the wall of the operating room, making the panel flush with the wall surface. The cut-outs are placed side by side in three rows. Between and below the porcelain cut-outs the frame is covered with sheet iron. The direct-current buses run through the porcelain cut-outs. Indicating instruments are all



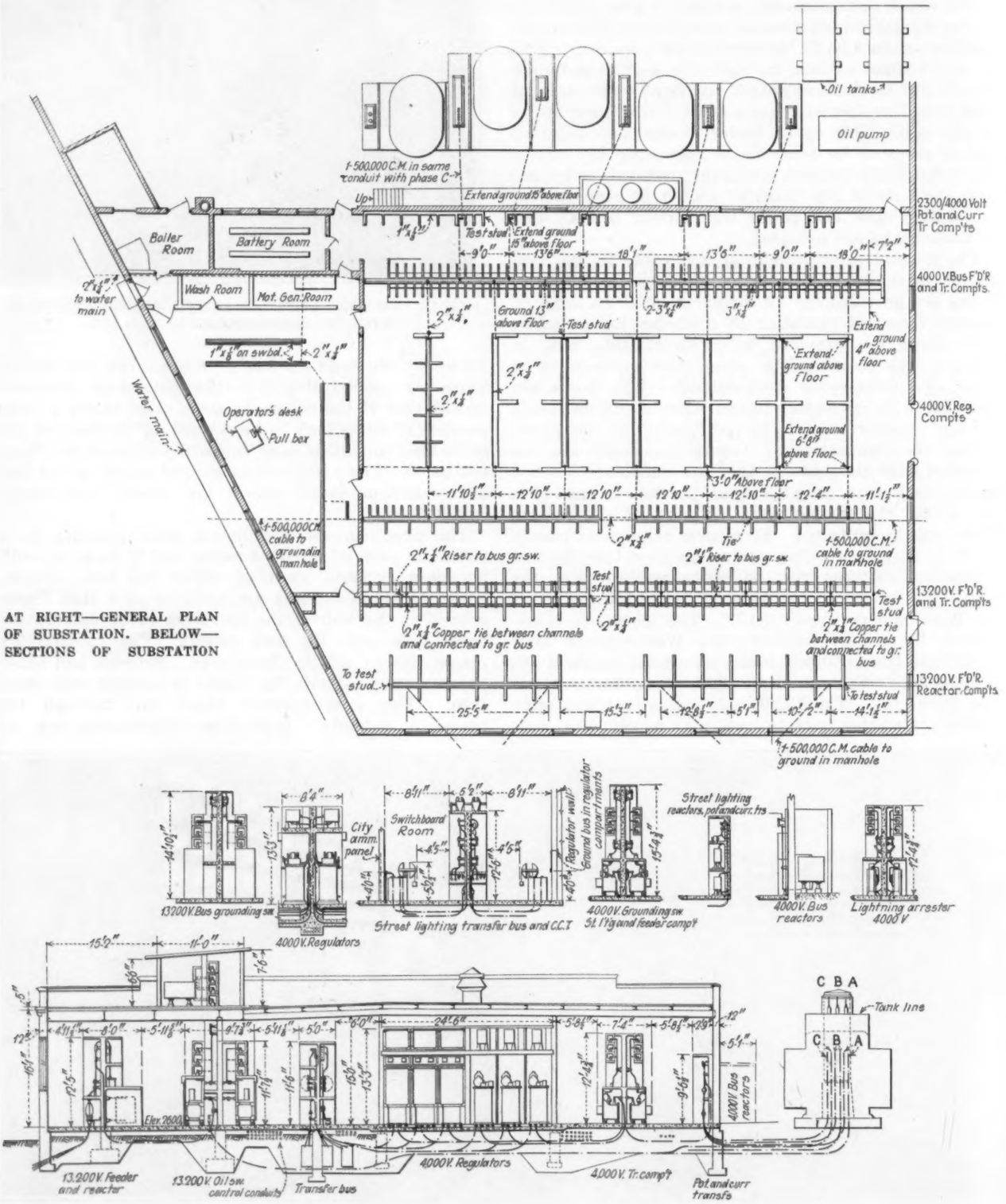
VIEW OF 13,200-VOLT PANELS AND PART OF THE 2,300/4,000-VOLT PANELS IN THE OPERATING ROOM

General Electric horizontal edgewise type, and the control switches are Westinghouse drum type.

The lighting system in the operating room is indirect and consists of X-ray reflectors mounted in a trough, which in turn is mounted on the switchboard supports behind the switchboard. This arrangement provides lighting from concealed sources and gives a very satisfactory illumination in the room.

A sixty-cell 80-amp.-hr. storage battery is installed in a separate room for oil-switch operation and emergency lighting. This battery is charged by either one of two 5-kw. motor-generator sets. One of these motor-generator sets is always running. The emergency lighting, which consists of about 40 per cent of the regular lighting, is automatically switched on to the battery if the alternating-current source fails.

The substation was designed by the company's engineering division, and all the construction work except that on the original building was done by the company's construction division.


Oil tanks
Oil pump
1-500,000 C.M. in same conduit with phase C
Extend ground 15" above floor
2300/4000 Volt Pot. and Curr Tr. Comp'ts
Boiler Room
Battery Room
Wash Room
Mot. Gen. Room
4000 V. Bus F'd'r and Tr. Comp'ts.
Ground 13" above floor
Test stud
Extend ground 4" above floor
Extend ground above floor
Extend ground 6'8" above floor
4000 V. Reg. Compts
Operator's desk
Pull box
Water main
3'-0" Above floor
1-500,000 C.M. cable to ground in manhole
2"x¼" Riser to bus gr. sw.
Tie
13200 V. F'd'r. and Tr. Compts
2"x¼" Copper tie between channels and connected to gr. bus
To test stud
13200 V. F'd'r. Reactor Comp'ts
1-500,000 C.M. cable to ground in manhole
13200 V. Bus grounding sw.
City comm. panel
Switchboard Room
Regulator well
Ground bus in regulator compartments
4000 V. Regulators
Street lighting transfer bus and C.C.T.
4000 V. Grounding sw. St. l'g ground feeder compt
Street lighting reactors, pot. and curr. trs
4000 V. Bus reactors
Lightning arrester 4000 V
Elev. 2600
13,200 V. Feeder and reactor
13,200 V. Oil sw. control conduits
Transfer bus
4000 V. Tr. compt
Pot. and curr. transfs
Tank line
C B A

AT RIGHT—GENERAL PLAN OF SUBSTATION. BELOW—SECTIONS OF SUBSTATION

Costs of Electric Heating

Heating Equipment for Industrial Use Should Be Fitted to the Process—Basis of Comparison from Cost Standpoint

BY E. F. COLLINS
General Electric Company

THERE is no direct constant relation between the calorific value of heat source and the "over-all" cost in industrial heating. The over-all cost is a function of (1) the character of the heating cycle required by the product under manufacture, (2) the equipment provided for the application of heat, (3) the conditions under which the equipment is operated, (4) the efficiency of operators, and (5) the cost of the heating medium, be it electricity or fuel. All these factors combined determine the factory costs of fuel or electricity.

The quantity of energy consumed affects the cost of production usually to a lesser degree than any other single factor listed above. Fuel consumption for a given process may easily be twice as great in one furnace as in another doing the same work but having a more efficient design. Again, it is true that a well-designed equipment may be so inefficiently operated, especially in fuel furnaces, that it consumes double or treble the quantity of heating fuels or electricity that a watchful and highly efficient operator would use for the same production with correct methods of operation.

Few manufacturers can control the price paid for their fuel directly. A manufacturer can, however, keep his cost of fuel to the minimum by using furnaces and heating equipment designed to suit his processes and conditions in his own plant, rather than by using heating apparatus designed only to produce heat, but which does not apply and utilize it with the greatest efficiency in each individual process. In other words, he should fit his heating equipment to the process and not attempt to fit his process to the equipment.

USE OF "FORM VALUE"

Another feature which enters into the selection of a particular fuel or electricity, and which is many times greater in economic value for a heating process than the B.t.u. content of the fuel or the perfect release of the heat content, is what has been termed "form value."

Were it not for the form value, and if the B.t.u. content of the fuel were the whole criterion, then the use of oil or manufactured gas could hardly prove economical, in the face of the low cost of bituminous coal, from the standpoint of its B.t.u. content. It must be admitted that this form value is somewhat intangible, but in the over-all cost of production it appears as a very real element.

Form value results from physical condition or chemical combinations in a heat-energy source, entirely separate and apart from B.t.u. content, such that an advantage comes about in the application of its heat to useful service. Here the price of fuel or electricity, type of furnace and the heat balance for the process are excluded from the commonly accepted conception of form value.

Hence, when the furnace engineer surveys a given process and considers various fuels or electricity as the source of heat, he should not neglect to give due consideration to form factor—a very real factor influencing over-all costs. This is equally important—indeed, it is many times more important than such factors as price of fuel or electricity or B.t.u. heat content, heat balance for the process or the first cost of the heating apparatus.

It is desired to emphasize here the absolute necessity for the furnace engineer to make a study and survey covering in detail the foregoing general factors, vital to a correct design for heating equipment which will produce the most efficient results. Whether the heating shall be done with fuel or electricity can be correctly determined only from such study. If electricity be selected, then should heat be generated by resistance, by induction or by the arc? If fuel is to be used, then what form of fuel will give lowest over-all cost?

Much fuel-burning equipment is met with today which shows that proper analysis of the application of heat has not been made. Had this been done, many fuel-fired devices now in use would already have been discarded for the electric, while others would have been redesigned to give the most that fuel firing has to offer.

As an illustration of the latter statement there may be found in a prominent furnace engineer's bulletin the tabulated instances here reproduced of economy effected by proper selection and design of a fuel furnace to meet heating requirement and plant conditions. The items in the table are sufficient to indicate that

ECONOMY OF FUEL FURNACES IN INDUSTRIAL USE

Process	—Per Cent of Increase of Output— Per Unit Floor Space	Per Unit of Fuel
Small drop forge (a)	37	78
Small drop forge (b)	275	27
Small drop forge (c)	250	47
Large drop forge	..	90
Heat treating steel	17	33
Hardening steel parts	50	..
Annealing steel	103	25
Carbonizing	..	90

industrial heating processes should receive the attention of the trained furnace engineer, and that when this practice is followed, they are bound to result in much economy. One is apt to be concerned over a matter of 1 or 2 per cent in the efficiency of a motor, and yet the table reveals that an improvement of at least from 25 to 275 per cent may be attained not infrequently by competent furnace engineering. Were the opportunity given to study conditions existing in the heat-treating, hardening, annealing and carbonizing furnaces embraced in this table, with due consideration to the advantages of the electric furnace, it would, no doubt, be concluded that these furnaces would give a still higher "over-all" efficiency if electrically heated. This is not mere conjecture, but the result of experience in using the electric heat for these processes. Where quality enters as an important factor and the usual rates for electric power prevail, it seldom happens that fuel will show lower over-all costs of manufacture, or that it will produce the same great uniformity and high physical characteristics in the heat-treated product.

Coal, oil, gas and water power are the principal present-day sources of energy in the country. This group furnishes the energy required by modern conditions. It is estimated that about one-third of this energy is devoted to the production of heat and light, or, in other words, something like 150,000,000 tons of coal is used for metallurgical processes. This fuel is used with an average efficiency the country over of about 10 per cent

in metallurgical furnaces. An average of 250 miscellaneous oil-burning furnaces gave a thermal efficiency of 9.2 per cent.

It may be interesting to note that if a good steam-electric plant delivers 12 per cent of the fuel at the bus, and if a super steam-electric plant delivers 19 per cent of the fuel B.t.u. at the bus, then an electric furnace with a thermal efficiency of 80 per cent will in the first case utilize 9.6 per cent of the fuel in useful work, while in the second case it will at the same efficiency deliver 15.2 per cent of the energy of coal burned under the boiler to the charge to be heated. Since the cost of burning coal is less in the central station than the fuel furnace for metallurgical purposes, it is evident that electric heat conserves coal supply and often may compete with fuel processes without any serious handicap from the B.t.u. cost factor. In some cases where water power is sufficiently available the lower cost may be on the side of the electrically generated B.t.u.

Hand in hand with the proper selection of a furnace for industrial heating processes, and coincident with the selection of electric heat energy, specifications should be well worked out covering the best type, its design, size of unit, number of furnaces, their arrangement in the line of production and the grouping of auxiliary equipment, such as that for transportation, handling, cooling and testing.

The same definite natural laws control cooling that control heating. Hence for successful results and low over-all costs it is important to give to the cooling equipment the same careful design as to the heating equipment. Control must be provided, so far as is possible, to maintain required relations between temperature, cycles of heating and cooling, giving due consideration to surface exposed and underlying mass in order to get maximum quality and quantity of production and economical operation.

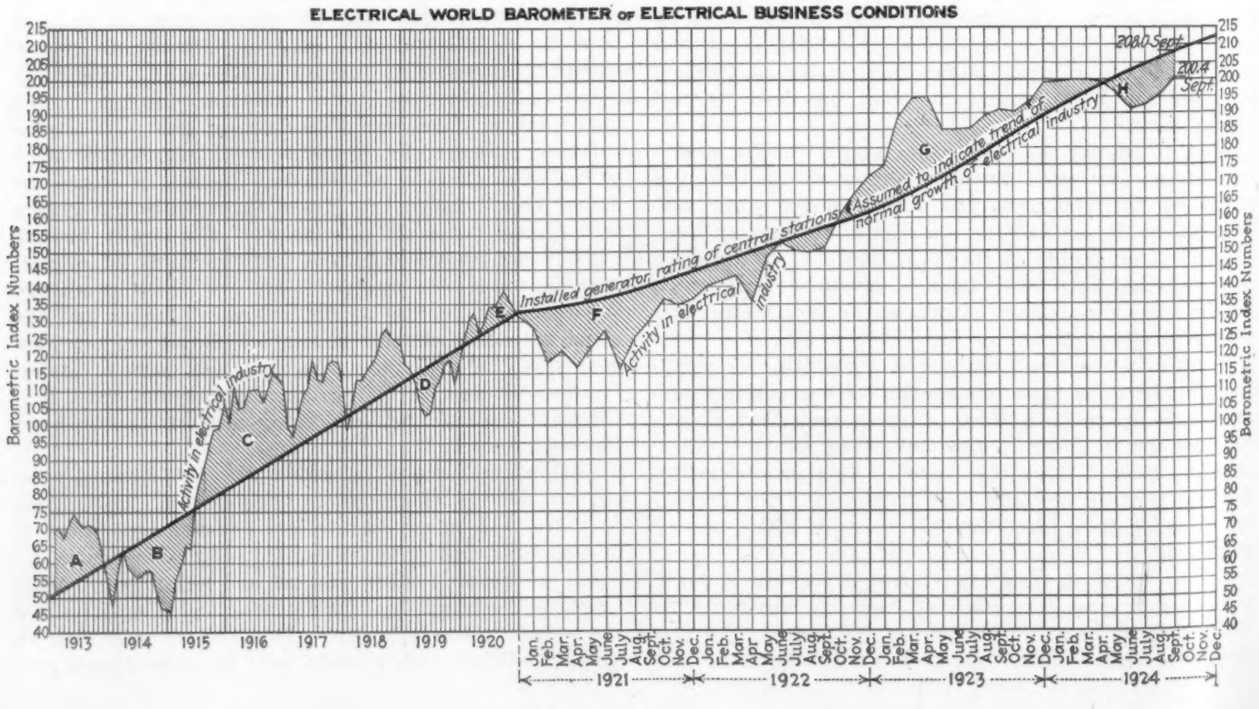
Many wrong deductions regarding the efficiency of electric heating come from comparing an inefficient electric furnace, perhaps improperly operated and in design not suited to the specific process and manufacturing conditions, with a fuel-fired furnace which is suited to the fuel and the process and is more efficiently operated. The difference in economy resulting is too often charged to the difference between electric heating and fuel heating.

In order to forestall charges of misapplication of a fuel, designs must take advantage of the inherent characteristics of electricity or of a fuel, as the case may be. Again, furnaces of the box type, used by intermittent charging, should not be compared with the "tunnel" continuous-conveyor type, neither should non-compensated or non-regenerative furnaces be compared with compensated or regenerative types and equal performance expected. In such cases one should look for a more or less wide variation in performance between the different types when used under the same conditions. The lowest over-all cost of production will

Improved Conditions During September

FIGURES upon which the "ELECTRICAL WORLD Barometer of Business Conditions in the Electrical Industry" are based indicate that during September the upward tendency in business activity was continued. This was indicated not only by the activity of industries outside the electrical industry, but also by the activity of the electric light and power branch of the industry.

An increase during September of 5.0 points on the barometer scale, as compared with August, is shown. During the interval the industry grew 1.2 points, making a net increase in activities of 3.8 points on the barometer scale as compared with August. The electrical industry was, therefore, operating during September at 7.6 per cent below what would have been the point of seasonal demand if growth in the industry had been normal. In August it was operating at 11.4 (revised) per cent below and in July at 12.3 per cent below the point of normal demand.



usually demand one particular type, depending upon its requirements of the product.

The effect exerted on over-all cost by form value of heat sources (fuels and electricity) is very much veiled in practice by a wide divergence in the economic advantages gained, depending upon the managerial ability of the users. Under a poor management the most advantageous "form energy" may be wasteful. Electrical energy, however, under good management renders substantial returns by virtue of its form in many industrial processes.

The demands of the future can be satisfied only if better heating equipment, better methods of heating—many times this means electric—and better handling facilities are provided, not forgetting that competent engineers to select the equipment and the best operators to handle it are essential to the realization of minimum over-all costs.

Truth About Electric Rates in Ontario

Analysis of 1923 Reports of Hydro-Electric Power Commission of Ontario and Affiliated Municipalities Shows that Extremely Low Rates Exist in Relatively Few Places—Residential Consumers Greatly Favored

By WILLIAM M. CARPENTER
Engineer, New York City

GOVERNMENT ownership advocates in this country have drawn a great deal of attention to the operations of the Hydro-Electric Power Commission of Ontario. The fact that in many localities of southern Canada the cost of electric service to the domestic, or residential, consumer is far lower than that commonly met with in the United States has been used by the proponents of public ownership—well meaning and otherwise—to show the plausibility of their schemes on this side of the frontier. In every discussion of this topic conditions in the Province of Ontario have occupied the most prominent place, as indicating the solution of the problem of economical hydro-electric development and the beneficial results of the distribution of "power at cost" to the community.

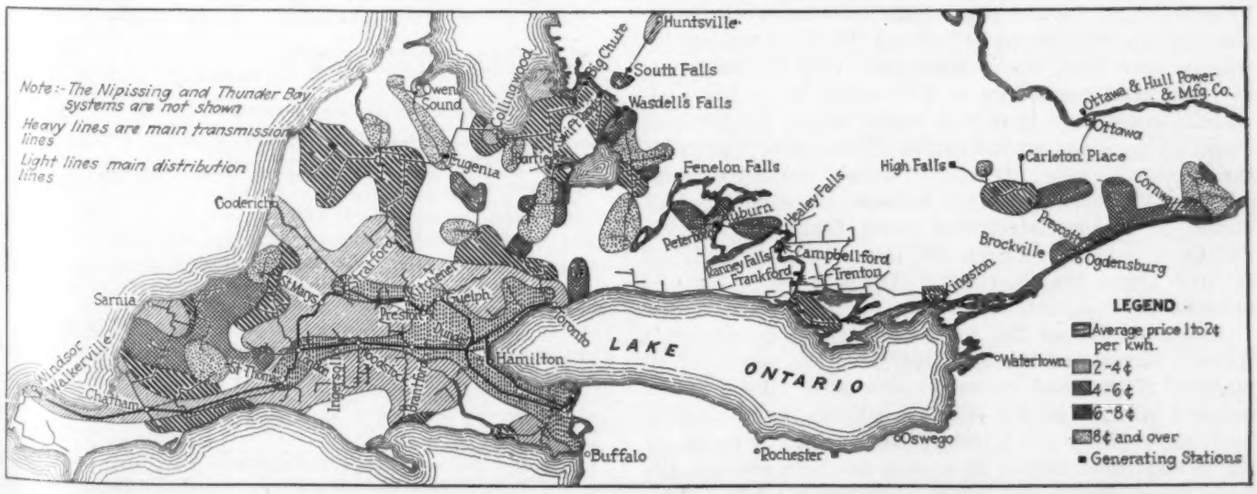
While there appears to be no dispute as to the excellence of the purely technical aspects of the Canadian enterprise, there is equally no doubt as to the basic divergence of its rate structure from that which has become almost axiomatic in this country through thirty years of experience and judicial interpretation.

Its policy, as will be seen from the subsequent analysis, goes further than the problem of mere prices for electricity; it becomes a fundamental question of political economy: Is it a function of government to subsidize the voters which support it by furnishing them—below cost—with the commodities which it controls? Such a policy, while attempted in this country under various guises, has always been vigorously rejected, and the fundamental doctrine has been established that the price of service must be in a measure comparable to the cost of such service.

It is of great interest, therefore, to analyze the rate structure in effect on the Hydro-Electric Commission's system in order to ascertain how this apparent cheapness of residential electricity is brought about.

Such an analysis is an undertaking of considerable difficulty, for the commission's fiscal year ends October 31 and that of the municipalities on December 31. Not only do many of the reports of the individual municipalities fail to check with themselves or with the abstracts made of them in the commission's annual report, but all mention of the one vital fact—the total sales of electricity in kilowatt-hours—has been omitted throughout with, apparently, the utmost circumspection.

The operations of the Hydro-Electric Commission occupy the larger portion of "old Ontario," with an isolated development on the Nipigon River at the extreme western end of the province and another small, isolated development on the Nipissing River, east of Georgian Bay. The Hydro system is composed of thirteen divisions, most of them interconnected, by which



AVERAGE PRICES FOR DOMESTIC SERVICE IN DISTRICTS SERVED BY HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO

electricity is furnished to adjacent communities. Some power is sold directly to industrial consumers; the rest is farmed out to municipalities for further distribution. There are 356 of these municipalities, including 107 townships and rural districts. Of the 356, 235, with a total population of about 1,600,000, operate under "cost contracts" with the commission and the major details of their operations are listed in the commission's annual report. No information is available concerning the 121 others. In addition, there appear to be more than a score of other municipalities, some of them in the heart of the commission's territory, which are "on their own" and have no relations whatever to the Ontario power scheme.

The low-priced rates are mostly confined to a relatively small zone in the extreme southeast portion of the Ontario peninsula and fed by the main trunk lines of Niagara power. In the rest of the territory, covering the far larger area, domestic rates range anywhere up to 16 cents per kilowatt-hour.

Much is always made by the advocates of municipal ownership of the average prices for domestic service, such as 1.3 cents per kilowatt-hour within sound of Niagara; but little attention is usually drawn to such municipalities as those grouped in Table I.

Table II concerns 201 municipalities whose operations are completely listed in the report and shows that in more than half the average price paid is above 5 cents per kilowatt-hour for domestic and commercial service.

LOW PRICE OF "DOMESTIC" ELECTRICITY

It is always on the basis of domestic rates alone that the results of the Ontario Hydro-Electric Power Commission are quoted. Comparisons are inevitably made between this one classification and a base rate (usually selected from some small community) for retail energy in the United States. These rates in the larger towns are ridiculously low—far lower than anything elsewhere either in Canada or in this country. Table III shows the average prices paid in some of the typical industrial cities for electricity in 1923.

A striking point brought out by this table is that the average price for "commercial light"—that is, for business places—is far above that for residential use, although the consumption in the former is several times that in the latter. That this is the prevailing practice, and not merely the peculiarity in selected municipalities, is shown by Table IV, which represents the totalization of the 201 municipalities whose returns are complete in "Statement D" of the "Hydro" report. It will be seen that the average price per kilowatt-hour to residential consumers is 2.15 cents, while for commercial consumers it is 3.09 cents, almost 50 per cent more. This gives an indication of the basic theory of the Ontario rate structure which suggests some pertinent questions. Is it because of superior load factor or lower distribution costs that the domestic consumer, who is numerically far in the majority, is favored above the merchant? Or is it for other and more subtle reasons?

A comparison of the prices for wholesale power is difficult because of the omission from the report of all mention of the total kilowatt-hours used. Some of the detailed returns of the individual municipalities, however, show either the kilowatt-hours used for power or the entire consumption of energy in their community; from these, figures for power costs can be determined.

The comparisons in Table VII show the prices for various classifications of electricity during 1923 in some of the typical Ontario municipalities, as compared with similar cities in New York State.

These figures give a further clue to the characteris-

TABLE I—DOMESTIC AND COMMERCIAL RATES IN EIGHT COMMUNITIES

	Average Price (Cents) per Kilowatt-Hour, 1923	
	Domestic Use	Commercial Light
Agincourt	6.2	13.9
Arthur	9.2	12.7
Bloomfield	7.6	12.4
Kincardine	4.3	12.8
Lanark	9.3	14.1
Lucknow	9.5	15.6
Wardsville	15.0	11.3
Woodville	7.6	12.7

TABLE II—AVERAGE PRICE PAID FOR RETAIL ELECTRICITY IN 201 MUNICIPALITIES OF THE ONTARIO HYDRO-ELECTRIC SYSTEM

Average Price (Cents) per Kw.-Hr. Sold	Domestic Service		Commercial Light	
	No. of Municipalities	Per Cent of Total	No. of Municipalities	Per Cent of Total
1 to 2	21	10.4	13	6.5
2 to 3	31	15.4	30	14.9
3 to 4	19	9.5	26	12.9
4 to 6	49	24.4	40	19.9
6 to 8	49	24.4	44	21.9
8 to 10	22	10.9	21	10.4
Over 10	10	5.0	27	13.4
Total	201	100	201	100

TABLE III—AVERAGE PRICE PER KILOWATT-HOUR PAID IN 1923 FOR RETAIL ELECTRICITY IN TYPICAL ONTARIO MUNICIPALITIES

Municipality	Miles from Niagara	Domestic Service		Commercial Light	
		Average Use per Consumer per Month	Average Cost per Kw.-Hr., Cents	Average Use per Consumer per Month	Average Cost Per Kw.-Hr., Cents
Ottawa	*	122	1.1	306	1.6
Niagara Falls	...	153	1.3	405	1.2
Stratford	115	126	1.4	200	2.1
Woodstock	95	87	1.6	217	1.9
London	120	89	1.6	297	1.6
Hamilton	40	70	1.7	206	1.5
Kitchener	90	90	1.6	327	1.7
Guelph	70	62	1.9	188	2.2
St. Thomas	135	68	1.9	193	2.0
Toronto	75	69	2.1	234	4.0
Port Arthur	100†	67	2.1	193	2.5
St. Mary's	125	61	2.4	79	3.3
Chatham	180	49	2.7	166	3.0

* Electricity purchased from the Ottawa & Hull Power & Manufacturing Company. † Nipigon System.

TABLE IV—USE OF ELECTRICITY IN 1923 IN 201 ONTARIO MUNICIPALITIES

Classification	Revenue	Total Use Kw.-Hr.,	No. of Users	Average Use per Month	Average Price per Kw.-Hr., Cents
Domestic service	$5,127,191	238,273,537	283,892	70	2.15
Commercial light	3,224,752	104,268,306	46,462	187½	3.09
Total	$8,351,943	342,541,843	330,354	86½	2.44

TABLE V—THUNDER BAY SYSTEM (Year ended October 31, 1923)

Total operating and maintenance expenses	$66,943.06
Interest (on total capital of $6,864,225)	406,611.92
Total expenses	$473,554.98
Amount paid by city of Port Arthur for electricity	280,423.71
Balance "deferred and collectible out of future revenue"	$193,131.27
Additional balance "deferred" as of October 31, 1922	318,320.65
Addition "deferred" because of "adjustments made in the last fiscal year"	109,366.41
Total "deferred" as at October 31, 1923	$620,818.33

TABLE VI—TOTALIZATION OF CAPITAL ACCOUNTS

	Hydro-Electric System	Affiliated Municipalities (Operating under "Cost Contracts")
Capital invested	$171,057,672.81*	$48,428,562.56
Interest on above	4,959,115.84†	2,607,741.71‡
Per cent on capital	2.90	5.39
Sinking fund, depreciation, renewal of plant, contingencies	$2,270,865.52	$916,782.75
Per cent on capital	1.32	1.89

* Excluding street railways.
† Totalization of accounts of individual systems.
‡ Includes "debenture charges."

tics of the rate structure of the "Hydro" municipalities. Making due allowance for taxes, total electricity is no cheaper in Ontario than across the frontier. It is only the differential in favor of the domestic user which makes it appear so. This is true not only for particular cases but for the entire Hydro-Electric system.

Table VIII gives the comparison between the entire Ontario system and the hydro-electric plants of New York State. The latter include ninety-two generating and distributing companies, supplying more than 650 communities whose activities are predominantly hydro-electric.

It will be noted that the table is based upon electricity generated—not sold—because of the limitations of the Ontario report. The figures are, however, quite comparable on this basis; and if it be assumed—as it may with propriety—that line and transformer losses are similar on both sides of the frontier, the comparison will apply to sales as well.

Including taxes, the average price received in New York State in 1923 per kilowatt-hour generated was 1.016 cents. Deducting taxes, this becomes 0.911 cent. In Ontario the corresponding figure was about 0.878 cent. It is evident, therefore, that the private companies, in spite of their standby steam service furnishing 10 per cent of the total, are supplying energy as cheaply as the municipally owned system of Ontario and, in addition, are making a reasonable profit for their investors.

Attention is frequently called to the high per capita consumption of electrical energy in Ontario, but a glance at the accompanying figures shows that in comparable territories in the Province of Ontario and in the State of New York energy consumption per capita in the latter territory is greater by 240 kw.-hr. per year. If the amount of energy used by various industries at Massena is included, the per capita consumption for that part of New York State under consideration becomes 1,900 kw.-hr. annually, or 21 per cent higher than in Ontario.

Several other items of the report indicate how some of the low rates for electricity can be obtained. Note the balance sheet (Table V) of the Thunder Bay system, which furnishes energy for the city of Port Arthur (pages 286-288 of the sixteenth annual report), where the domestic user pays, on the average, 2.1 cents per kilowatt-hour.

The commission's report shows no consolidated balance sheet, and those of the individual systems "overlap" somewhat and make a totalization difficult. Such figures as are available show, however, extremely low capital charges, as may be seen in Table VI.

TABLE VII—PRICE FOR VARIOUS CLASSIFICATIONS OF ELECTRIC SERVICE IN ONTARIO AND NEW YORK STATE

TORONTO, Ont. (1923)—75 Miles from Niagara Falls

(Compiled from the report of the Hydro-Electric Power Commission, the report of the Municipal Hydro Commission of Toronto, and the paper of P. T Davies before the World Power Congress, 1924.)

Classification	Kw.-Hr. Sold	Revenue	Average Price per Kw.-Hr., Cents
Domestic service	84,345,839	$1,817,880	2.1
Commercial light	44,149,870	1,776,972	4.0
Commercial power	166,424,880	2,296,896	1.38
Municipal power	71,988,732	772,049	1.07
Street lighting and miscel.	25,458,225	421,375	1.65
Total	392,367,546	$7,085,172	1.81

BUFFALO, N. Y. (1923)—16 Miles from Niagara Falls

(As per report filed with New York Public Service Commission.)
Taxes paid, 1923: $758,063, or 0.124 cent per kilowatt-hour sold; 27 per cent of system electricity generated by auxiliary steam plant.

Classification	Kw.-Hr. Sold	Revenue	Average Price per Kw.-Hr., Cents
Domestic and commercial lighting	127,825,000	$4,298,072	3.35
Power	385,774,000	3,355,301	0.87
Street lighting, arc	5,456,000	209,411	3.84
Street lighting, incandescent	6,385,000	295,316	4.63
Municipal and miscellaneous	3,772,000	109,087	2.90
Total*	529,207,000	$8,267,187	1.56

* Street-railway power excluded so as to make comparable with other cities

PRESCOTT, Ont. (1923)

(From report of the Hydro-Electric Commission and information furnished by municipality.)

Classification	Kw.-Hr. Sold	Revenue	Average Price per Kw.-Hr. Sold, Cents
Domestic service	176,463	$8,617	4.89
Commercial lighting	111,852	4,948	4.42
Power*	326,288	6,351	1.95
Street lighting	170,000†	4,508	2.65
Total*	784,603	$24,434	3.11

* Includes municipal power, largely waterworks pumping
† Estimated on basis of lamps installed.

OGDENSBURG, N. Y. (1923)

Classification	Kw.-Hr. Sold	Revenue	Average Price per Kw.-Hr. Sold, Cents
Domestic and commercial lighting	1,684,417	$99,864	5.93
Retail power	2,385,939	52,414	2.19
Total electricity sold*	21,024,193	$224,850	1.07

* Includes street lighting, street railway and wholesale power.

TABLE VIII—COMPARISON OF ONTARIO AND NEW YORK HYDRO-ELECTRIC PLANTS

Hydro-Electric Power Commission of Ontario and Affiliated Municipalities, 1923

Taxes paid (by Ontario Power Company and Toronto Power Company), $182,342.
† 224 out of 235 municipalities operating under "cost contracts."
(As shown in the sixteenth annual report of the Hydro-Electric Power Commission and the New York Public Service Commission reports.)

	Kw.-Hr.
Generated by hydro-electric plants*	2,632,000,000
Generated by steam stations, less than	1,000,000
Purchased from "private" electric companies	210,000,000
Total electrical energy available*	2,843,000,000
Less: Exported to New York State†	435,000,000
Total electrical energy for use in Ontario	2,408,000,000
Population served 1923	1,600,000
Kilowatt-hour consumption per capita	1,500

REVENUES FROM SALES OF ELECTRICITY

(a) Revenues received by municipalities†	$16,903,000
(b) Received by Hydro-Electric Commission directly from consumers*	5,540,000
Total revenues	$22,443,000
Less: Revenues from exported power†	1,110,000
Revenue from the public in Ontario	$21,333,000

Average price to public per kilowatt-hour generated 0.886 cent.
*Fiscal year ending October 31. †Calendar year.

Hydro-Electric Plants of New York State, 1923

(Includes ninety-two companies whose generation or distribution is predominantly hydro-electric energy. Does not include power furnished to various industries at Massena, N. Y., by the Montreal Light, Heat & Power Company from Cedars Rapids.)

	Kw.-Hr.
Generated by hydro-electric plants	3,288,000,000
Generated by steam stations	440,000,000
Purchased from companies not public utilities	67,000,000
Imported from Ontario	739,000,000
Imported from Vermont	4,000,000
Total hydro-electric kw.-hr. used in New York State	4,538,000,000
Population served 1923	2,600,000
Kilowatt-hour consumption per capita	1,740*
Total revenues from sales of electricity	$52,477,000
Less sales between companies	6,370,000
Revenue from public in New York State	$46,107,000
Average price to public per kw.-hr. generated, cents	1.016
Revenue from public in New York State	$46,107,000
Taxes on electric operations of companies	4,743,000
Total	$41,364,000
Average price, deducting taxes, per kw.-hr. generated, cents	0.911
Average Hydro and affiliated municipalities, deducting taxes	0.878
Difference in favor of Ontario (3.75 per cent)	0.033

* Adding approximately 420,000,000 kw.-hr. furnished to industries at Massena, N. Y., from Quebec, this becomes 1,900 kw.-hr. per capita.

Eliminating the item of taxes and in spite of the low cost of the "Hydro" financing, possible only because of the commission's governmental affiliation, it is evident that the average price of electricity in Ontario is not essentially different from that charged by private companies in similar localities in New York State, where the utilities must pay taxes, much higher interest rates and still show a profit. The much-heralded cheapness results solely from the differential made in favor of the domestic consumer, which in turn is not a question of management but of political expediency. In all discussions of this subject this fundamental fact must be clearly recognized. If the question of governmental ownership of public utilities is to be seriously debated, it would be better by far to argue it out upon this basis of paternalism rather than upon the popular misconceptions and the half truths by which the issue is purposely beclouded in this country.

Development of Electrical Refrigeration for Ice-Cream Retailers

Adoption by Ice-Cream Manufacturers of Electrically Operated Machines Instead of Ice and Salt Packing Means Additional $10,000,000 Yearly Revenue for Central-Station Companies

THOUGH much attention from central-station commercial men has been concentrated on the possibilities of the domestic type of refrigerator, there has in the meantime been a rapidly growing development of a commercial-size electric cabinet for containing ice cream on the retailers' premises. For the central-station company the use of these machines opens up a new source of revenue particularly attractive because of its load characteristics. Commercially, however, the sale and installation of this equipment must be approached from an angle considerably different from that to which the central-station man is accustomed.

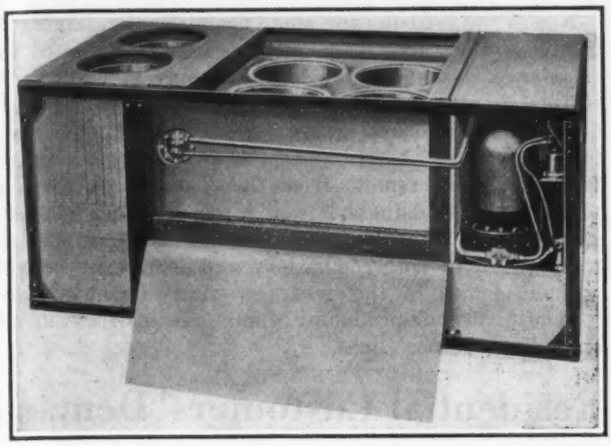
To understand just how the central-station company fits into this service it is interesting to examine briefly some of the peculiarities of the ice-cream business. It is an almost universal custom in the manufacture and sale of ice cream that the manufacturer or wholesaler owns and maintains the packing cabinets used by the retailer and which remain on his premises. In addition, the manufacturer supplies free of charge the necessary ice and salt for packing. The packing and repacking of these cabinets is done by the ice-cream manufacturer at the time of daily deliveries. This is a slow, cumbersome and expensive system which has materially increased costs. Particularly during hot weather and on holidays when the demand is the heaviest and labor most difficult to obtain and hold, the problem of keeping these cabinets iced is a serious one. Ice cream improperly or insufficiently packed deteriorates rapidly. If the temperature is permitted to rise above a certain point, it begins to shrink even though not actually melting, and once it has softened in the container, when repacked, it acquires a coarser texture in hardening, and small particles of ice appear. Moreover, it occupies a smaller space than when originally frozen, and this shrinkage is an absolute loss to the retailer, who in turn holds his supplier responsible. Bacteria becomes active at a relatively low temperature, and in a cabinet inadequately packed the ice cream is very likely to sour and become worthless.

Electrically refrigerated cabinets prevent these losses from spoilage and in addition make possible very decided economies over the ice-and-salt method in the cost of delivery. Summed up briefly, electric refrigeration offers the ice-cream manufacturer and retailer the following distinct advantages:

1. No packing and repacking of the cabinet.
2. No muss and dirt from salt and ice.
3. No shrinkage of soft ice cream.
4. No difficulty in serving too hard an ice cream.
5. Greater sanitation—no loss or spoilage from sour ice cream.
6. Constant refrigeration at low cost.
7. Lower cost of product delivered to customer, consequently increased profit to the manufacturer.

Offsetting these advantages in a measure is, of course, the investment that the ice-cream manufacturer must make in electrically operated refrigerating cabinets to replace the old style ones using ice and salt. It should be remembered that such a cabinet must be furnished each retailer to whom the manufacturer supplies ice cream, and each cabinet costs in the neighborhood of $500. Despite this very considerable investment, a number of ice-cream manufacturers, notably in Cleveland and Detroit, are rapidly replacing their ice-and-salt cabinets with those of the electric type. The reason for this is readily apparent upon study of the accompanying tabulation showing a comparison between the cost of delivery and upkeep with an ice-and-salt cabinet and the corresponding cost with an electrically operated cabinet. The total cost per gallon for the ice-and-salt method is 33 cents, against 18⅝ cents for this particular electric cabinet—a saving of 14⅜ cents. Under the ice-and-salt method 54 lb. of weight is carried per gallon of ice cream delivered. With the electric refrigerator 9 lb. of weight is carried per gallon delivered—a ratio of six to one. Practically, this makes possible a reduction of two-thirds in size and number of trucks.

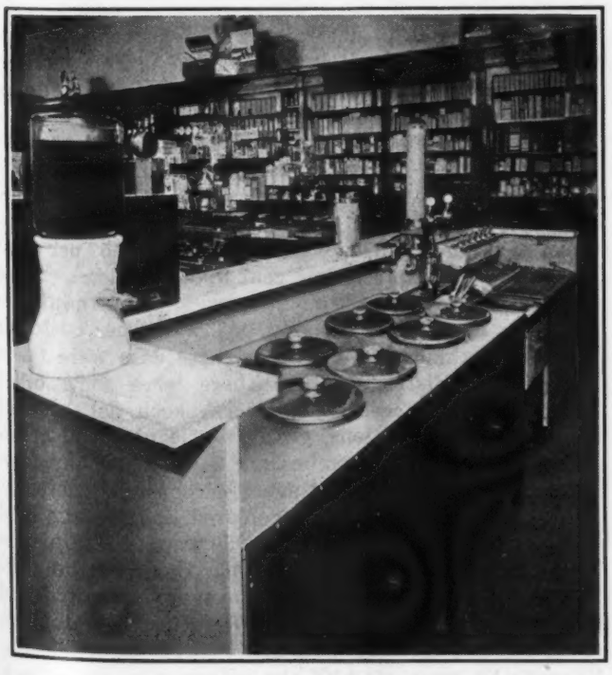
The ice-cream industry has long been faced by the excessive cost of distributing ice cream under the old ice-and-salt cabinet system. The cause of this is obvious when it is considered that it has been necessary to transport approximately 48 lb. of ice and salt for each gallon of ice cream in order to be sure that the



SIX-HOLE ICE-CREAM CABINET SHOWING COMPACTNESS OF SELF-CONTAINED REFRIGERATING MACHINE

frozen product would be even moderately well kept on the retailers' premises. To be able to effect such an economy with the added assurance that his product after it reaches the retailer's store will always be in first-class condition makes the adoption of the electric cabinet very attractive to the ice-cream manufacturer. The principal obstacle to a more rapid adoption of electrical equipment is the amount of the investment necessary and the fact that not all ice-cream manufacturers are aware of the possible savings.

Several manufacturers of domestic-type refrigerators have developed and are making machines for use by ice-cream dealers. One refrigerator manufacturer, located in Detroit, has concentrated his efforts on the production of an electrically operated ice-cream cabinet, of which upward of five thousand have been installed in Cleveland and Detroit. From the operation of the machines, some of which have been in use for the last three years, there is ample experience to demonstrate their economic value to the user, and data taken on individual installations show their desirability to the central-station company. Four, six and eight-hole cabinets are now being manufactured.



ELECTRICALLY REFRIGERATED ICE-CREAM CABINET INSTALLED IN SODA FOUNTAIN

Operating records covering periods up to three years on a number of installations show that in a four-hole cabinet the motor operates for periods of from three-fourths to one and a half hours at a time for a total of three to four hours per day. The motor in an eight-hole cabinet operates for similar short periods and for a total of from five and one-half to seven hours per day. The running time of the six-hole cabinet falls naturally midway between these. Operation is maintained automatically at all times. There is no manual cutting in or cutting out. The range of time shown by the above figures is to be accounted for by seasonal changes, by the volume of business done and by the condition of the ice cream when it is placed in the cabinets. The accompanying table shows the cost of operating the various sizes of cabinets for approximate periods of one year in Detroit. The charges shown are based on energy at 5 cents per kilowatt-hour less 5 per cent discount. The demand was found to be about 300 watts, varying 5 per cent or 10 per cent above or below, according to conditions.

It should be noted that whereas the approximate energy cost per hole the year around averages about 1½ cents per day, the cost in winter will be down to 30 per cent lower and in summer up to 30 per cent more. This places the maximum consumption of energy in the summer—a most desirable point as it tends to balance the normal high winter lighting load.

The approximate kilowatt-hour consumption per day is as follows: Four-hole, 1.0; six-hole, 1.4; eight-hole, 1.9.

New Source of Revenue for Central Stations

The use of these machines opens up to the central station a new source of revenue. It is particularly attractive because of the small demand, its diversity and hours' use. The record of a group of twelve machines in Detroit used in ice-cream cabinets, assuming 300 watts average demand, shows an average annual revenue at a 5-cent rate of approximately $87 per kilowatt demand of undiversified demand. The record of consumption on ninety-six machines on ice-cream cabinets in Cleveland during the month of May showed an average use of 1.47 kw.-hr. per machine per day, which checks very closely with the Detroit data.

The annual revenue per machine is at least equal to and generally more than the average revenue per residential customer. It requires no additional investment on the part of the central-station company as it is connected to the regular commercial lighting circuit. Under the present arrangement the ice-cream manufacturer furnishes, installs and services the ice-cream cabinet to his customers. In some instances he makes a certain allowance for the amount of energy which will be used by the machine; in a few cases a separate meter is installed and the ice cream manufacturers pay the amount billed, while in other cases the ice-cream retailer is glad to pay the small addition to his lighting bill for the better service and convenience he enjoys.

Commercially the field for development by the central-station company is large. It is estimated that there are 250,000 ice-cream retailers in the United States, all of whom are good "prospects" for an electrically operated ice-cream cabinet. This would add approximately $10,000,000 to the central-station companies' gross annual revenue. Furthermore, this load

TABLE I—COMPARISON OF ICE-AND-SALT CABINET UPKEEP WITH THAT OF ELECTRICALLY OPERATED CABINET

Ice-and-Salt Cabinet			
Ice required per gallon delivered	$0.08		
Salt required per gallon delivered	0.03		
Ice and salt cabinet maintenance	...		
Ice and salt cabinet depreciation	0.03	$0.14	
Driver's wages per gallon delivered	0.07		
Auto expense per gallon delivered	0.12	0.19	$0.33
Electrically Operated Cabinet			
(Investment $425)			
Depreciation at 10 per cent	$42.50		
Interest on investment at 10 per cent	42.50		
Energy	30.00		
Service	35.00		
Total	$150.00		
Cost per gallon (1,200 gal. per year)		$0.12½	
(Driver and truck expense reduced two-thirds)			
One-third of driver's wages saved	0.02½		
One-third of truck expense saved	0.04	0.06½	0.18½
Saving per gallon			$0.14½

COMPARISON OF WEIGHT CARRIED IN DELIVERY OF ICE CREAM UNDER TWO METHODS

Ice-and-Salt Cabinet	Lb.		Electric Cabinet	Lb.	
Ice	42		Ice and salt	2	
Salt	5		Ice cream	5	
Ice cream	5		One-fifth of weight of can	2	9
One-fifth of weight of can	2	54			

can be connected to the lines without any added investment.

How the central-station company can best promote this load will vary in different cities, depending upon local conditions. Ice-cream stores may be divided into two classes—those which freeze and retail their own product and those which buy their ice cream and icing service from a manufacturer or wholesaler. Thus there are two angles by which the central-station company may approach this business. In the case of the store which makes and retails its own ice cream it is a question of selling single outfits to the individual retailer. These, however, are very much in the minority, and the greater volume of this business will be obtained through the adoption of the electrically operated cabinet by large ice-cream manufacturers because of the actual saving in money and the better service and maintained quality of their product. One fair-sized ice-cream manufacturer, supplying from 200 to 500 retailers, if converted from the ice-and-salt method of packing to the use of the electrically operated cabinet, would earn revenue for the central-station company equal to that derived from all the residential customers in a small town.

TABLE II—COST OF OPERATING ICE-CREAM CABINETS

Period	No. Days	Size of Cabinet	Bill for Energy
Store A 3-29-23 to 3-31-24	368	Eight-hole	$30.26
Store B 3-29-23 to 3-31-24	368	Eight-hole	35.67
Store C 3-29-23 to 3-31-24	368	Eight-hole	32.07
Store D 3-20-23 to 3-31-24	368	Eight-hole	35.11
Total	1,472		$133.11
Average cost per day per eight-hole cabinet, $0.0904			
Store E 3-29-23 to 3-31-24	368	Six-hole	$27.42
Store F 3-29-23 to 3-31-24	368	Six-hole	27.08
Store G 5-18-23 to 3-31-24	368	Six-hole	20.29
Store H 6-23-23 to 3-31-24	202	Six-hole	18.10
Total	1,336		$92.89
Average cost per day per six-hole cabinet, $0.0695			
Store I 4-17-23 to 3-31-24	349	Four-hole	$22.28
Store J 5-29-23 to 3-31-24	307	Four-hole	16.21
Store K 3-29-23 to 3-31-24	368	Four-hole	20.29
Store L 3-29-23 to 3-31-24	368	Four-hole	17.49
Total	1,392		$76.27
Average cost per day per four-hole cabinet, $0.0547			

Nor is the field for the small commercial refrigerator confined to the ice-cream business alone. Some of the other uses to which these machines may be applied are soft-drink stands, water coolers, grocery stores, milk depots, meat markets, florists, restaurants, lunch counters, cafeterias, hotels and places already having refrigeration but remote from the cold-storage room or service. This business is well worth considerable time and study by central-station men as the small electric refrigerator of both commercial and domestic type will, without doubt, in the next few years be among the foremost revenue-producing appliances on the central-station companies' lines.

Residential Customers' Demand

Its Relation to Connected Load and Other Factors Is Ascertained by Arkansas Central Power Company

NOT long ago the Arkansas Central Power Company, Little Rock, conducted a very careful survey in some of the residential sections of that city to ascertain the demand of the various classes of customers. While the survey was made as the basis for laying out secondaries in residential sections, the information is also useful for commercial departments as an indication of what effect stimulating lighting and appliance loads will have on the company's business. The data collected show the relation of demand to connected load and transformer rating, the character and magnitude of active and inactive customers and loads, the nature of connected lamp and appliance loads, and the relation of active and inactive rooms in the residences observed. The information, which is presented here through the courtesy of L. F. Griffith, formerly superintendent of light and power for that company, is strictly reliable, he declares, since actual demand-meter tests were made on the secondary of each transformer and actual installations were checked up. While the conditions presented in Little Rock have changed to some extent since the compilation of these data, owing to added loads, and while the information may differ from that obtained on other systems on which there have been differing degrees of load stimulation or different conditions, the information presents some interesting facts.

From detailed study of it interesting observations may be made. For example, as shown by the boldfaced type in the tables, indicating minimum, maximum and average figures, the connected load per customer averages 1,320 watts, of which 55 per cent is lighting load and 45 per cent appliance load. Some departures are made from this average, the minimum average connected load being 947 watts per customer and the maximum 2,656. Since these data were taken in residence districts where there were some other loads besides domestic consumers', such as those of drug stores, fire stations, groceries, cleaning and pressing establishments, churches and lodge halls, the foregoing figures apply to the average connected customer. If the residences only are considered, the average total connected load per customer is 1,360 watts, the minimum being 955 and the maximum 2,560. Based on the number of rooms in active use, the average connected load per room for all classes is 220 watts, the minimum being 185 and the maximum 283. Other deductions can be made by comparing all the information given, each column referring to the load on one transformer.

TABLE I—RELATION OF DEMAND TO CONNECTED LOAD AND OTHER FACTORS

Connected Load:	A	B	C	D	E	F	G	Sum.
Total active, kw	28	37.4	47.8	61.2	78.6	98.5	109.6	461.2
Per customer, watts	1400	1131	**2656**	1459	**947**	1037	1891	**1320**
Per connected socket, watts	71.5	69.5	51.9	78.0	83.4	78.0	61.2	69.8
Lighting, kw	14.8	19.8	33.3	29.2	36.5	50.7	69.5	253.7
Lighting, per cent of total	53.0	52.9	**69.7**	47.7	**46.2**	51.5	63.5	**55.0**
Lighting, per customer, watts	742	598	**1850**	695	**440**	533	1200	**726**
Appliances, kw	13.2	17.6	14.6	32.0	42.1	47.8	40.1	207.4
Appliances, per cent of total	47.0	47.1	**30.3**	52.3	**53.6**	48.5	46.3	**45.0**
Appliances, per customer, watts	658	532	**808**	763	507	**503**	691	**594**
Number of customers (active)	20	33	18	42	83	95	58	349
Demand:								
Combined, kw	2.75	2.8	8.25	9.9	11.0	13.2	15.13	63.0
Combined, per customer, watts	137	**85**	**458**	238	132	139	261	**180**
Combined, per socket, watts	7	5.2	8.95	12.6	11.7	10.5	8.4	9.6
Combined, per cent of connected load	9.8	**7.5**	**17.3**	16.2	14.0	13.4	13.8	**13.7**
Lighting, per cent of connected load	18.5	**14.2**	24.8	**33.9**	30.1	26.0	21.8	**24.9**
Appliances, per cent of connected load	20.9	**16.0**	**56.7**	30.8	26.1	27.6	37.8	**30.4**
Transformer Rating:								
Installed, kw	15	5	10	7.5	10	10	30	87.5
Per cent of connected load	**53.6**	13.4	20.9	12.2	12.7	**10.1**	27.4	**19.0**
Per cent of demand	**545**	179	121	75.7	91.0	**75.7**	198.0	**139.0**

TABLE II—CHARACTER OF ACTIVE AND INACTIVE CUSTOMERS AND LOADS

	A	B	C	D	E	F	G	Sum.
Customers:								
Total, number	23	34	18	44	83	95	62	355
Total, kw	32.9	37.9	47.8	63.6	78.6	98.5	123.3	482.7
Active, number	20	33	18	42	83	95	58	349
Active, kw	28	37.4	47.8	61.2	78.6	98.5	109.6	461.1
Residences, number	18	33	18	42	80	93	56	340
Residences, kw	24.7	37.4	47.8	61.2	76.5	97.9	108.5	454
Drug stores, number	1	....	....	....	....	....	....	1
Drug stores, kw	2.2	....	....	....	....	....	....	2.2
Fire stations, number	1	....	....	....	1	....	....	2
Fire stations, kw	1.1	....	....	....	0.55	....	....	1.65
Groceries, number	....	....	....	....	....	1	....	1
Groceries, kw	....	....	....	....	....	0.47	....	0.47
Combined residences and stores, number	....	....	....	....	2	1	2	5
Combined residences and stores, kw	....	....	....	....	1.6	0.18	1.1	2.8
Inactive, number	3	1	....	2	....	....	4	10
Inactive, kw	4.9	0.6	....	2.4	....	....	13.7	21.6
Churches, number	....	1	....	2	....	....	1	4
Churches, kw	....	0.6	....	2.4	....	....	1.8	4.8
Groceries, number	1	....	....	....	....	....	....	1
Groceries, kw	1.3	....	....	....	....	....	....	1.3
Cleaning and pressing, number	1	....	....	....	....	....	....	1
Cleaning and pressing, kw	1.7	....	....	....	....	....	....	1.7
Lodge halls, number	1	....	....	....	....	....	....	1
Lodge halls, kw	1.97	....	....	....	....	....	....	1.97
Rectifiers, number	....	....	....	....	....	....	3	3
Rectifiers, kw	....	....	....	....	....	....	11.9	11.9

TABLE III—NATURE OF CONNECTED LAMP LOAD

	A	B	C	D	E	F	G	Sum.
Lamps:								
Total number	334	458	791	662	777	1039	1511	5572
Total kw	17.21	20.36	33.3	31.6	36.5	50.7	71.2	260.8
Average watts	**51.5**	44.4	**42.1**	47.6	46.9	48.8	47.1	**46.9**
Carbon:								14760
Watts in these classifications:								
10	....	....	....	10	30	90	20	150
30	30	120	210	270	300	960	480	**2370**
50	350	50	850	800	1700	3400	2650	**9800**
60	60	....	60	540	420	480	....	1560
80	....	....	320	....	160	320	80	880
Tungsten:								193175
Watts in these classifications:								
10	60	60	10	70	60	220	190	760
15	210	90	705	150	90	390	435	2070
25	1225	1900	5050	2975	2825	2500	5550	22025
40	4240	6560	9520	6480	11200	11320	20160	**69480**
50	2050	6150	4750	6600	8150	8450	14000	**50150**
60	3360	2700	4920	6780	5280	10200	14100	**47340**
100	500	500	100	800	....	500	200	2600
250	....	....	....	....	....	250	500	750
High-efficiency:								50850
Watts in these classifications:								
50	....	....	800	850	....	600	....	**2250**
75	1575	1724	3675	2850	2400	6225	7800	**26250**
100	1800	500	2200	1800	2800	4600	3700	**17400**
150	150	....	....	....	150	....	150	450
200	1600	....	....	600	600	200	....	3000
300	....	....	....	900	300	....	1200	1500

TABLE IV—NATURE OF APPLIANCE LOAD

	A	B	C	D	E	F	G	Sum.
Appliances:								
Total number	43	44	48	81	95	117	112	540
Total, kw	15.7	17.6	14.6	32	42.1	47.8	40.2	210.1
Average watts per unit	366	400	**303.1**	395.9	**443.6**	408	359	**389**
Watts connected:								
Irons	10230	15400	9900	22000	36630	41030	25300	**160490**
Vacuum cleaners	750	1350	1200	2250	2550	3150	3150	**14400**
Toasters and toaster stoves	2775	....	550	5575	1700	....	4975	**15575**
Percolators	....	....	1500	1500	500	1500	4000	**9000**
Heating pads	....	....	130	65	....	65	....	260
Curling irons	....	60	60	....	....	120	180	420
Heaters	....	....	....	....	....	....	550	550
Sewing machines	50	....	150	150	100	....	150	600
Toy transformers	....	....	100	100	....	200	....	400
Toy motion-picture machines	100	....	....	....	....	....	....	100
Stereopticons	400	....	....	....	....	....	....	400
Vibrators	....	....	....	....	....	....	40	40
Washing machines	360	675	360	....	510	930	450	**3075**
Drink mixers	25	....	....	....	....	....	....	25
Motors	740	....	....	....	....	300	....	1145
Fans	300	100	600	400	150	500	1425	**3475**

The average combined demand of all customers on the seven secondaries observed was 180 watts per customer, the minimum being 85 and the maximum 458. This average demand constituted about 13.7 per cent of the connected load, the lighting demand being 24.9 of the connected load and the appliance demand 30.4 per cent of the connected load.

As shown by the information given regarding the ratio of transformer rating to connected load and demand, considerable difference exists between the seven cases considered. On the average, the transformer rating is 19 per cent of the connected load, ranging from 10.1 per cent to 53.6 per cent. The ratio of transformer rating to demand indicates an overrating in most cases, the average being 139 per cent, the minimum 75.7 per cent and the maximum 545 per cent.

Studying the lighting load of all customers, it will be observed that the average wattage per lamp is 46.9, the minimum 42.1 and the maximum 51.5. Ranked according to connected loads, tungsten lamps predominate, there being about thirteen times the connected load in these lamps that there is in high-efficiency lamps. The carbon lamp load is about three and one-half times that of the high-efficiency lamps, or a little more than one-quarter over that in tungsten lamps. Again ranked for connected load, 40, 50 and 60-watt tungsten lamps appear to be used in the order named, 50-watt and 30-watt carbon lamps rank in the order mentioned, and high-efficiency lamps rank in the following order—75, 50 and 100 watts.

The average wattage of appliances used in the seven cases is 389, that in one case being 303.1 and in another 443.6. Ranked by connected load, the appliances fall in the following order of percentage: Irons, 76.5; vacuum

TABLE V—RELATION OF ACTIVE TO INACTIVE ROOMS IN ONE-STORY AND TWO-STORY HOUSES

	A	B	C	D	E	F	G	Sum.
Rooms:								
Total, number	189	345	324	404	662	840	808	3572
Active, number	106	193	169	224	413	530	419	2063
Active, per cent of total	56.1	56	52.2	55.5	62.4	63.1	51.8	**57.8**
Two-story houses:								
Number	3	9	16	3	5	14	28	78
Per cent of total	15.0	27.3	88.9	7.1	6	14.7	48.3	22.3
Rooms:								
Total, number	32	121	303	35	55	204	509	1259
Active, number	17	65	157	20	32	115	248	654
Active, per cent of total	53.2	53.7	51.8	57.2	58.2	56.4	48.7	**51.9**
One-story houses:								
Number	17	24	2	39	78	81	30	271
Per cent of total	85	72.7	11.1	92.9	94	85.3	51.7	77.7
Rooms:								
Total, number	157	224	21	369	607	636	299	2313
Active, number	89	128	12	204	381	424	171	1409
Active, per cent of total	56.7	57.2	57.2	55.3	62.8	66.7	57.3	**60.9**

cleaners, 6.85; toasters and toaster stoves, 7.4; percolators, 4.3; fans, 1.7, and washing machines, 1.5 per cent.

As having some bearing on the data observed, it may be noticed that a little more than 22 per cent of the residences were two-story houses and about 78 per cent were one-story houses. In these the active rooms constituted 51.9 per cent and 60.9 per cent of the rooms available respectively. Considering both classes of houses, about 58 per cent of the rooms were in active use. The data also indicate the nature and magnitude of inactive customers.

Letters from Our Readers

Favors 4,000-Hour Burning Schedule for Street Lamps

To the Editors of the ELECTRICAL WORLD:

I have studied in detail the very constructive article entitled "Making Street Lighting More Desirable," appearing on page 958 of the May 10 issue of the ELECTRICAL WORLD, and find many valuable data therein which we certainly are glad to have at hand.

In the standard contract form which you show on page 960 is given a burning period from dusk to dawn of approximately four thousand hours. Such a burning schedule seems to be standard throughout the country and is the one that has prominence in all references to an "all-night" schedule with one notable exception, and that is the schedule which the ELECTRICAL WORLD publishes. In this is printed an "all-night" schedule of 3,730 hours and but brief mention is made of the 4,000-hour schedule. In connection with this you may be interested in the schedule maintained by the following cities on which we happen to have information:

City	Power Supplied by	Burning Hours per Year
Baltimore	Consolidated Gas, Electric Light & Power Company	4,000
Cincinnati	Union Gas & Electric Company	3,914
Cleveland	Cleveland Electric Illuminating Company	4,000
	Municipal Electric Light Plant	4,000
Dayton	Dayton Power & Light Company	3,940
Detroit	Detroit Edison Company	4,040
Philadelphia	Philadelphia Electric Company	4,094
Rochester	Rochester Railway & Light Company	3,984

I have had the opportunity of watching the Cleveland schedule in operation, and I must say that on the 4,000-hour-per-year basis the lamps are certainly not turned on any too soon; in fact, I have noticed a good many nights when I believe they could have been turned on earlier to advantage. Do you not believe that your schedule would be of more value to central stations if the 4,000-hour basis were the one used? O. F. HAAS,

Engineering Department.
National Lamp Works of General Electric Company,
Cleveland, Ohio.

The Engineer as a Victim of Supply and Demand

To the Editors of the ELECTRICAL WORLD:

With reference to the letter by T. T. Greenwood, published in the ELECTRICAL WORLD of September 27, I wish to say that his suggestion as to the need for engineers to display higher sales ability has some merit. It seems to my mind, however, that this suggestion indicates none the less a rather unsophisticated view of the situation as a whole. In the long run prices are governed by the law of supply and demand, and, generally speaking, a man's income is decided by what it would cost to replace him by a similar man rendering the same service.

In engineering competition is very keen, and granted that superior sales ability may gain a man a slight advantage or preference over another, his salary would in no way depart much from the average standardized pay given a man for rendering a demanded service, for the simple reason that in very short order he could be replaced by another man—speaking of the average and usual conditions which prevail in the vast majority of cases. Speaking without any specific references and in an entirely impersonal way, I venture to assert that there exists today an oversupply of good men—thousands of whom could at a minute's notice step into a much bigger job, if the demand existed. That is the fundamental condition we have today. We reached the saturation point years ago, but overenthusiastic college deans and presidents have done nothing to slow down the machinery of quantity production.

To my knowledge, there exists no college in these United States demanding a six-year course for engineers. I should like to ask some dean or college president the reasons by which he is guided. Apparently heads of technical schools think that it requires greater intelligence to treat a man's bodily ailments than to design, construct and operate an economic superpower system, for example. According to Mr. Greenwood's argument, every engineer should take a year's post-graduate work in expert salesmanship so as to sell his services to better advantage. If all did so, it would not alter the situation even by one hair.

The national engineering societies also are doing nothing to improve the economic conditions of the engineers. They have committees on telephonic interference, relays, meters, overhead distribution, underground distribution and a thousand and one things. Have you ever heard of a committee for the betterment of engineering conditions? These national engineering societies, with all due respect for the otherwise wonderful work they accomplish, remind me of the landlord that looked so much up into heaven that he forgot the dying tenant on the floor below. GEORGE F. MARSTELLER.

Boston, Mass.

An Italian Automatic Substation

THE hydro-electric station at Pessinetto, Italy, which supplies power for the cotton mills in the Lanzo Valley, is interesting in that it is automatically controlled from a distance by methods which differ from those usually employed. The plan is somewhat akin to that adopted in America in connection with small and medium-sized hydro-electric plants; that is, if the water supply is sufficient for the purpose, to run the plant continuously in parallel with the main station. In the case of the Pessinetto plant the generating sets are run continuously at full capacity, any variation in the demand being provided by the control gear installed at and acting on the main station. A series of floats is included in the Pessinetto equipment which operate mechanism that cuts in or out the turbines in accordance with the available water level. The plant comprises two sets of Calzoni-Parento turbines coupled to Brown-Boveri alternators. The speed of each set is controlled by an oil-pressure automatic regulator, while the distance control of the turbines comprises a series of electro-valves which actuate an oil distribution system working with the servo-motors of the turbines.

Central Station and Industrial Practice

Remote-Control Breaker Operation

By O. S. Hockaday
Texas Power & Light Company, Dallas, Tex.

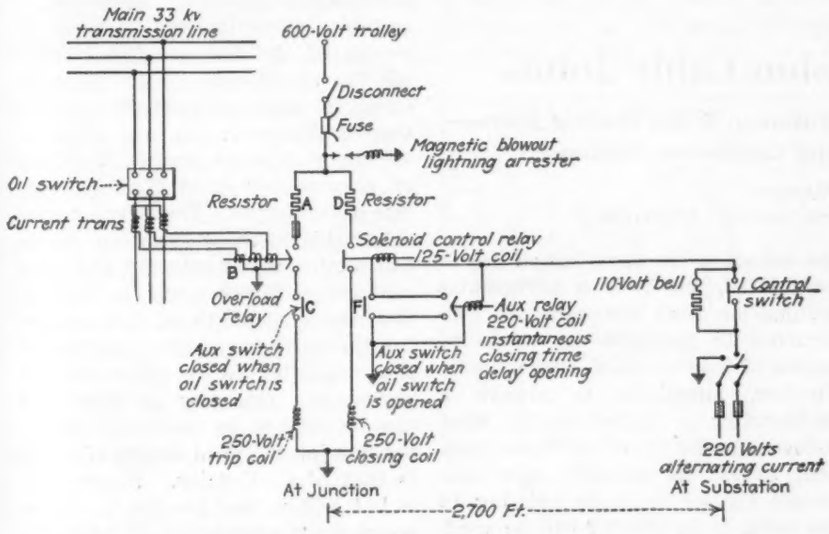
REMOTELY controlled oil switches, 2,700 ft. south of the Plano substation, solved the difficulty formerly met in refusing circuits after lightning storms. The 33,000-volt line supplying the towns of Murphy and Wylie, Tex., formerly tapped the main line with an air-break switch and a set of fuses. At the time these lines were constructed it was not practicable to extend the tap up to the substation. The old arrangement worked very well with the exception that when fuses blew during a lightning storm half an hour would elapse before the troubleman, stationed 13 miles away, could restore service.

With the growth of load, it became necessary that this service be improved. The cost of running the 33,000-volt line into the substation was prohibitive, so the only alternative was to replace the air switch and fuses at this junction with an oil circuit breaker provided with an overload relay and equipment for closing it from the substation.

With available pin space on the existing line limited to only one position and with no 125-volt direct-current energy at hand, it was necessary to work out some system in departure from the usual arrangement. It was unnecessary that provision be made for opening the oil switch from the substation. The solution narrowed down to a bell alarm for notifying a substation operator when the switch tripped and providing means for his reclosing it. The accompanying wiring diagram shows how this was accomplished at a nominal expense.

The new 35,000-volt oil switch installed at the junction for the tap to Murphy and Wylie was then equipped with a standard solenoid-control mechanism. Direct current for operating this mechanism was furnished through the courtesy of the Texas Electric Railway Company from its adjacent 600-volt trolley circuit. The trip and closing solenoids, wound for 250 volts, and suitable resistors *A* and *D* were connected in series. The circuit-closing inverse-time-limit overlay relay *B*, working off bushing-type current transformers, was used to afford protection against short circuits, grounds and surges set up by lightning. The auxiliary switch *C*, mechanically operated by the movement of the control, is in series with the relay contacts to break the arc after the switch opens.

For completing the circuit through the closing solenoid a standard instantaneous solenoid control relay is used, its coil being wound for operation at 125 volts alternating current. In series with this coil is a 110-volt alternating-current bell at the substation and auxiliary switch *F*. This auxiliary switch closes the bell circuit when the oil switch trips to notify the operator at the substation of such action, the ground acting as the other side of the circuit from the 220-volt alternating-current supply transformer. In order to insure that the oil circuit breaker shall complete its stroke in closing, an auxiliary circuit-closing relay is provided which is wound for 220 volts alternating current. When control switch *I* is closed, the contacts of this relay immediately close and keep the main closing solenoid energized, even after the auxiliary switch *F* opens, until the stroke is complete. The time-delay feature of the relay in opening holds the contacts closed sufficiently long in case the operator should release the control switch *I* too quickly.



REMOTE CONTROL FACILITATES OPERATION OF OIL SWITCH 2,700 FT. FROM SUBSTATION

Measuring Temperature by Resistance

By Earl E. Norman
Superintendent Department of Public Utilities, Kalamazoo, Mich.

WHEN in the service department of one of the large electrical manufacturing companies the writer had occasion to do considerable work measuring temperature by resistance, especially with resistance temperature indicators such as R. L. Frisbie referred to on page 318 of the August 16 issue of the Electrical World. The temperature-resistance formulas which could be used involve temperature coefficients referred to a variety of initial temperatures. However, practically all of these formulas indicate that copper has a zero resistance at 234 deg. below zero centigrade. Consequently, if the two temperatures involved are changed to absolute values (using — 234 deg. as absolute zero), the resistance will then vary proportional to these absolute temperatures.

The relation being shown by $\frac{T}{R} = \frac{T'}{R'}$ where T and T' are the two temperatures referred to — 234 deg.

C. as absolute zero, and R and R' the corresponding resistances at these temperatures. This is a simple proportion which can be worked out on any ordinary slide rule. When this work is done frequently a new scale can be added to the C scale of the slide rule, making the addition and subtraction of 234 unnecessary.

For convenience in using slide-rule subdivisions, 235 is used in this case, which will cause an error of less than 0.06 per cent. To add this scale to the slide rule, mark on scale C a zero above 235, 10 above 245, 20 above 255, etc., up to 160 above 395, or as high as may be desired. Negative temperatures can similarly be laid off to the left of zero. This new scale, in combination with the D scale, gives an exact proportion as in the formula except that the direct centigrade temperatures are used instead of absolute.

It is not necessary to calibrate these scales with reference to any particular temperature-resistance combination, it being applicable to any range of either temperature or resistance.

To show the application of the modified slide rule to a typical problem, assume the resistance of a copper conductor to be 10 ohms at 25 deg. C. Set 25 on the new scale over 10 on scale D. The resistance at any other temperature can then be read off D below the corresponding temperature on the new scale, thus at 50 deg. C. it would be 10.97 ohms, at 120 deg. C. 13.65 ohms, etc. The rules may be used for any other initial temperature-resistance combination.

The writer has used this extra scale on his slide rule very extensively and has always found it to check within half a degree with the temperature obtained by resistance formulas.

Design of High-Tension Cable Joints

Original Design of Cable Should Be Followed When Making Joints—Methods of Properly Insulating Conductors Outlined

BY C. G. WATSON
Design Engineer Duquesne Light Company, Pittsburgh

THE fact that simplicity is efficiency is far from being generally recognized by designers of high-tension cable joints is evident from the practice of many designers to put into a joint as varied an assortment of materials as possible. This practice is indefensible. Of course, the reply that is made to criticism of this sort is that such practice has given little trouble. Whether or not the reply is borne out by facts, I will not inquire, but I will remark that practices which have given no trouble in comparatively low-tension joints will not necessarily prove successful in high-tension joints; and in any case, while trouble is a positive criterion of failure, want of trouble is purely negative and does not prove that there may not be a more satisfactory practice. Experience in any one case is limited and should not be allowed to outweigh general considerations without proof, for it may be that careful attention to such considerations would lead to a design that would at least give no more trouble and at the same time be more economical either in labor or material, or in both.

It would appear that in designing a joint it would be advisable to follow, in so far as conditions permit, the design of the cable which has to be jointed, for it is a permissible assumption that the cable is constructed to perform the work required of it in the most efficient way. Further, simplicity is always a desideratum. Therefore, in what follows simplicity will be the keynote, and, so far as possible, only materials similar to those existing in the cable to be jointed will be used. That is to say, the principles of design are imitation and simplicity.

ATTENTION TO DETAIL NECESSARY

As in joints such as are now under consideration every detail may have an appreciable effect on the result, the first matter calling for attention is the connection of the conductors. To carry into effect the principle of imitation already laid down it would be necessary to join the conductors so that the joint was indistinguishable from the normal conductor, but, although it is quite possible to make a conductor joint of similar conductivity and similar diameter to the uncut conductor, and it may be that as voltages increase it will become necessary to spend the time needed to make such a joint, yet to do so at the moment is practically needless. Therefore, assume that a connector is to be used and that this connector will be so proportioned that undue heating and undue insulation stress will be avoided. In connection with the avoidance of heating, ample contact area should be allowed between the inside wall of the connector and the stranded conductor, and the thickness of the connector wall should take account of the difference in conductivity between the connector metal and the cable conductor. To avoid undue dielectric stress the connector should be rounded lengthwise by a generous curve.

MECHANICAL STRENGTH IMPORTANT

In situations where much expansion and contraction take place the mechanical strength of the conductor joint becomes of importance and a simple connector joint is unsatisfactory as it does not possess a tensile strength equivalent to that of the unbroken conductor. However, a suitable connection can be made by means of the Vernier braid joint, which possesses high tensile strength, high conductivity and low over-all diameter. In fact, the over-all diameter is no greater than that of a connector joint for the same size of conductor. The Vernier joint is suitable in those situations where contraction is not extreme, but when contractive forces reach the limit of the tensile strength of the conductor, the only way to avoid rupture of the conductor is to allow for its movement. One way in which this can be done is by means of an expansion joint, a good design of which is that of C. Vernier. However, it is but seldom that trouble is experienced from contraction in high-tension joints.

The next matter requiring attention, and one on which much time and ingenuity have been spent, is that of the insulation of the jointed conductor, and here we have to proceed empirically because our ignorance of the distribution of stress in a non-homogeneous dielectric is complete. No doubt, the simplest solution of the insulation problem would be to fill the inclosing sleeve with a homogeneous compound, but several difficulties obstruct such a solution. Among these difficulties are the practical one of keeping dimensions within reasonable limits and the fact that a paper and oil insulation gives greater dielectric strength than either alone. Besides, we have already laid down the principle that the joint is to be imitative of the cable.

To wrap paper tape around the jointed conductor as in the cable itself would be a long operation and, under the conditions prevailing in the situations where joints have to be made, undesirable; besides which the over-all length necessary to step each layer would be such as to be impracticable in the vast majority of the manholes at present constructed, but paper tubes impregnated with the compound used in the cable manufacture supply a material and enable dimensions to be kept within reasonable limits.

Applying Paper Tubes to Cable Joints

Among the ways in which paper tubes can be applied are the following:

1. The method introduced into this country by W. E. Boyle, in which a continuous paper roll, tapering slightly from one end to the other, of a width equal to the maximum length to be insulated, is wrapped around the jointed conductor; but while this method is simple and deserves extended use in certain cases, yet it suffers from the drawback that dust, air and moisture are liable to be inclosed within the layers during the wrapping operation. One way in which deleterious matter may be kept out of the joint during the wrapping of insulation in this and in other cases is by submerging, during the insulating operation, the cable and wrapping in a bath of impregnating compound of the kind used in impregnating the paper. As transmission voltages increase such a process may become imperative.

2. Another method is to have impregnated paper tubes of the desired length and thickness made at the factory and sent to the site in sealed containers, but this method necessitates that the joint be of such length that the tubes can be slipped over the cores before the conductor is jointed.

3. A preferable method is to have paper tubes made up of a number of concentric cylinders each of which is split lengthwise and each slipped over the jointed conductor. This method permits of a relatively short joint and keeps the over-all diameter within reasonable dimensions.

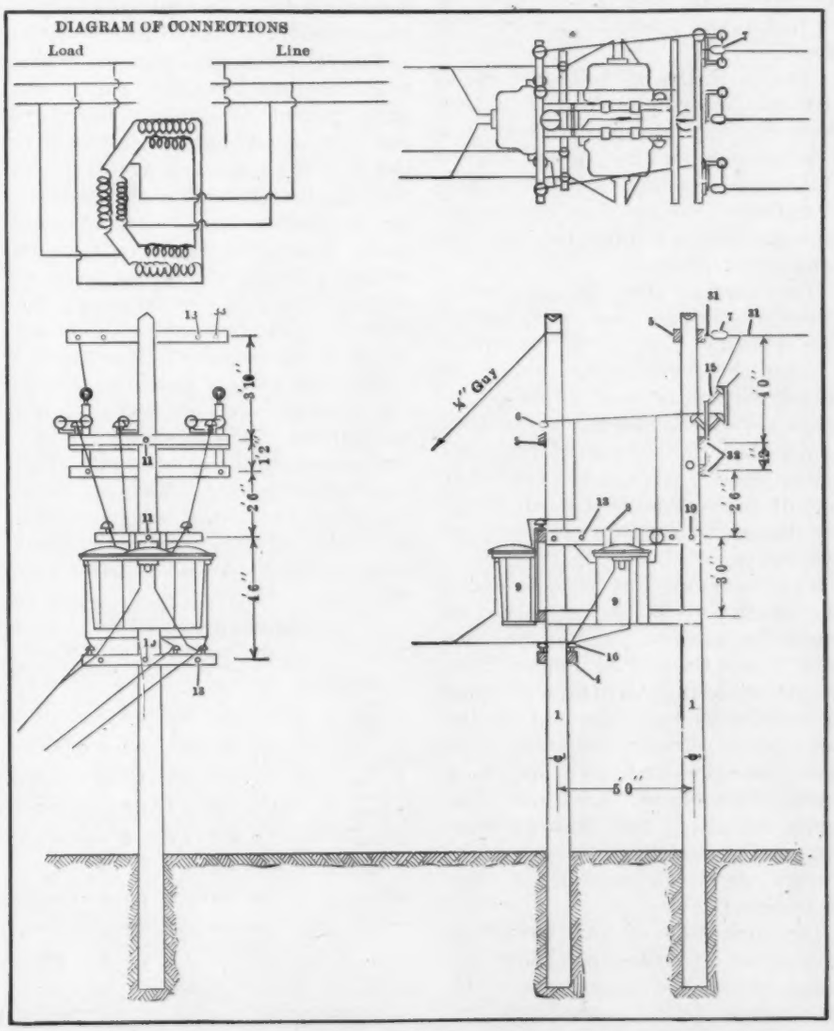
If it were possible to exclude all air and to have no voids, a lead sheath could now be formed around the insulated cores, but as this is impracticable, a sleeve of internal diameter greater than that of the cores has to be slipped over them and plumbed at each end to the cable sheath.

In order to exclude air and to fill voids, the sleeve is filled with a compound similar to that used in impregnating the cable, but in this connection it is to be borne in mind that an impregnated paper, or, for ease of application, linen tape, is of greater effect than compound alone, and in those places where such tape can be applied it should be done. Notably, such places are around the connector and the conductor where it has been stripped of paper and where the cable sheath has been cut.

In order to insure that at all times the sleeve shall be full of compound, it is necessary, when the impregnating compound is thin or the cable contains unfilled interstices, or when there will be great variation of temperature in operation — and the last condition is almost certain to occur—to provide some means for this purpose. A chamber connected to the sleeve by a small-bore tube is not to be recommended as the effect of friction in such a tube may be sufficient to prevent that free flow of compound needed to obviate voids occurring in the sleeve. A better arrangement, therefore, is to have a dome directly jutting from the sleeve, which dome at mean temperature shall be half full of compound and half full of air at atmospheric pressure.

Standardizing 6,600/440-Volt Outdoor Substations

TO PROVIDE 440-volt, three-phase service in the rice and oil field of Arkansas from a 6,600-volt circuit, the Arkansas Light & Power Company of Pine Bluff has standardized on the simple form of substation shown here. As indicated by the diagram and construction details, three transformers connected in delta on the high-tension and low-tension sides are hung from



PLAN AND ELEVATION OF STANDARDIZED TWO-POLE SUBSTATION

BILL OF MATERIAL FOR OUTDOOR SUBSTATION

Key	Number Required	Description of Material
1	2	25-ft. poles
2	1	3½-in. x 4½-in. x 3-ft. cross-arm.
3	1	3½-in. x 4½-in. x 4-ft. cross-arm.
4	2	3½-in. x 4½-in. x 5-ft. cross-arms
5	9	3½-in. x 4½-in. x 6-ft. cross-arms.
6	7	6,600-volt insulator
7	3	6,600-volt strain insulators
8	6	Transformer hangers
9	3	Transformers
10	5	¾-in. x 16-in. galvanized machine bolts
11	1	¾-in. x 14-in. galvanized machine bolts
12	4	¾-in. x 14-in. galvanized machine bolts
13	8	¾-in. x 16-in. galvanized bolts
14	1	¾-in. x 16-in. galvanized machine bolt
15	3	6-600-volt Royal disconnecting switches
16	6	D. P. D. G. insulators
17	3	Clevises
18	40 ft.	No. 6 hard-drawn bare copper wire
19	75 ft.	No. 0 T. B. W. P. copper wire
20	18	1½-in. x 28-in. galvanized braces
21	18	¾-in. x 6-in. galvanized carriage bolts
22	9	¾-in. x 4-in. log screws
23	12	2½-in. x 2½-in. x ¼-in. square washers, 3/16-in. hole
24	45	2½-in. x 2½-in. x ¼-in. square washers, 11/16-in. hole
25	12	2½-in. x 2½-in. x ¼-in. square washers, 9/16 in. hole
26	41	Round washers, 7/16-in. hole
27	13	1½-in. x 9-in. locust pins
28	30 ft.	¼-in. galvanized-iron guy wire
29	18	Wooden-pole steps
30	1	Anchor, complete
31	3	Splicing sleeves
32	6	¾-in. x 7-in. galvanized machine bolts
33	3	¾-in. x 16-in. dead-end hooks

three separate sets of cross-arms attached to two poles that are set 5 ft. apart.

The mounting of the transformers not only distributes load in a very desirable way but places them in a position for making simple electrical connections and leaves one pole practically free for dead-ending the line and for attaching the line disconnecting switches.

Two sets of arms for supporting the transformers are attached to the opposite sides of the two poles so that the transformers supported therefrom will be back to back. The other set of transformer cross-arms is attached to only one of the poles and at right angles to the two other sets of cross-arms mentioned, bringing the three transformers just 90 deg. apart.

The incoming line is dead-ended by strain insulators attached to double cross-arms on top of one pole. From these lines jumpers drop to disconnecting switches attached to cross-arms near the top of the same pole. Directly connected with these disconnecting switches is a short three-phase, 6,600-volt bus supported over the transformers. Jumpers connect this bus with high-tension delta connections of the transformer.

The load side of the circuit is dead-ended by cross-arms below the transformers and joined with the low-tension delta connections by short jumpers under the transformers.

Redistributing Transformer Locations Reduces Losses

BY G. T. BOGARD
Chief Engineer Kentucky Utilities Company, Louisville, Ky.

AFTER improving the distribution circuits by transformer relocation of a newly purchased utility in Kentucky, the Kentucky Utilities Company was able to lower the unaccounted-for losses during January, 1924, from 45 per cent to 23 per cent on July 1. Operating conditions in the small steam generating plant were at the worst possible stage when the utility was purchased in January, 1924. Steam leaks in the boiler room made it impossible to see objects more than ten feet away. Only part of the grate surface under each boiler was fired during light-load periods because the firemen said that if they covered the whole grate surface with fuel the boilers would "pop off." Improved firing methods and a general overhauling reduced the coal per kilowatt-hour from 14 lb. to 7.5 lb.

The electric distribution system then received attention, for it was in a pitiful condition. Forty-five per cent of the energy delivered to the system never reached the consumer. Primary lines were operating at 1,100 volts. In many cases these primaries were carried on ordinary brackets attached to trees and buildings. Lines were so slack that they swung together continually in windy weather. Transformer losses were thought to be responsible for a large part of energy unaccounted for. The distribution system contained 401 kva., mostly all in small transformers. Many of these transformers were of obsolete types. A study of the system layout showed a way to remove forty-six of the oldest transformers with a capacity of 173 kva. without affecting service. The saving in core loss amounted to 2.6 kw., or 22,776 kw.-hr. per year. With energy at production cost of 4 cents per kilowatt-hour, the saving in operating expense was nearly a thousand dollars. There was also a saving of $175 per year in taxes, interest, and similar charges. An investment of $1,200 was released by the sale of these surplus transformers.

The following figures are interesting in this connection:

Population of town	3,500
Number of electric customers	570
Peak load at station, kw.	120
Transformers originally in service, kva.	401
Transformers removed, kva.	173
Transformers left in service, kva.	228
Number of transformers removed	46
Unaccounted for losses January, 1924, per cent	45
Unaccounted for losses July, 1924, per cent.	23

Continued efforts on the part of the operating staff are reducing the unaccounted-for losses month by month. Further big savings will be made possible in November, 1924, when the local steam plant will be closed down and transmission line service brought in. The distribution voltage will then be changed from 1,100 to 2,300.

Chicago Sign Supports Simplified

FOLLOWING experience with the regulations covering the supports of electrical signs in Chicago, the number and size of chain guys for each side of the sign was changed by the Bureau of Electrical Inspection as in the following table. The concessions in strength over the old code (published in ELECTRICAL WORLD, March 31, 1923, page 743), are shown by the heavier type:

NUMBER AND SIZE OF CHAIN GUYS FOR EACH SIDE OF SIGN

Height in Feet		Length of Sign (Horizontal), Feet 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	No.	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
	Size	4/0	4/0	4/0	4/0	4/0	4/0	5/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0
2	No.	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2
	Size	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0
3	No.	1	1	1	1	1	1	2	2	2	3	3	3	3	3	3	3
	Size	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0
4	No.	1	1	2	2	2	2		2	2	3	3	3	3	3	4	4
	Size	4/0	4/0	4/0	4/0	4/0	4/0		4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0
6	No.	2	2	2	2	2	2				4	4	4	4	4	4	4
	Size	4/0	4/0	4/0	4/0	4/0	4/0				4/0	4/0	4/0	4/0	4/0	4/0	4/0
6	No.	2	2	2	2	2	2						4	3	3	3	3
	Size	4/0	4/0	4/0	4/0	4/0	4/0						4/0	8/0	8/0	8/0	8/0
7	No.	2	2	2	2	2	3								3	3	3
	Size	4/0	4/0	4/0	4/0	4/0	4/0								8/0	8/0	8/0
8	No.	2	2	2	2	3	3										4
	Size	4/0	4/0	4/0	4/0	4/0	4/0										8/0
9	No.	2	2	2	2	3	3										
	Size	4/0	4/0	4/0	4/0	4/0	4/0										
10	No.	2	2	2	2	3	3										
	Size	4/0	4/0	4/0	4/0	4/0	4/0										

Note.—For signs requiring more than three pairs of No. 4/0 side guys, one pair of No. 8/0 chains may be substituted for two pairs of No. 4/0 chains. For larger signs provide one pair of No. 8/0 chains for each 40 sq.ft. of sign surface.

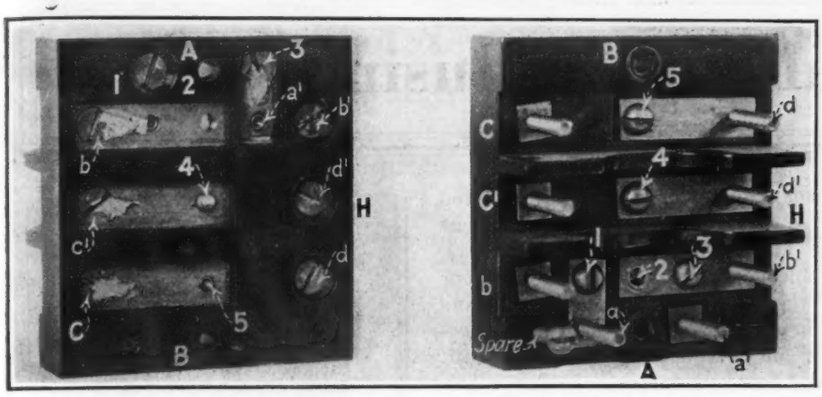
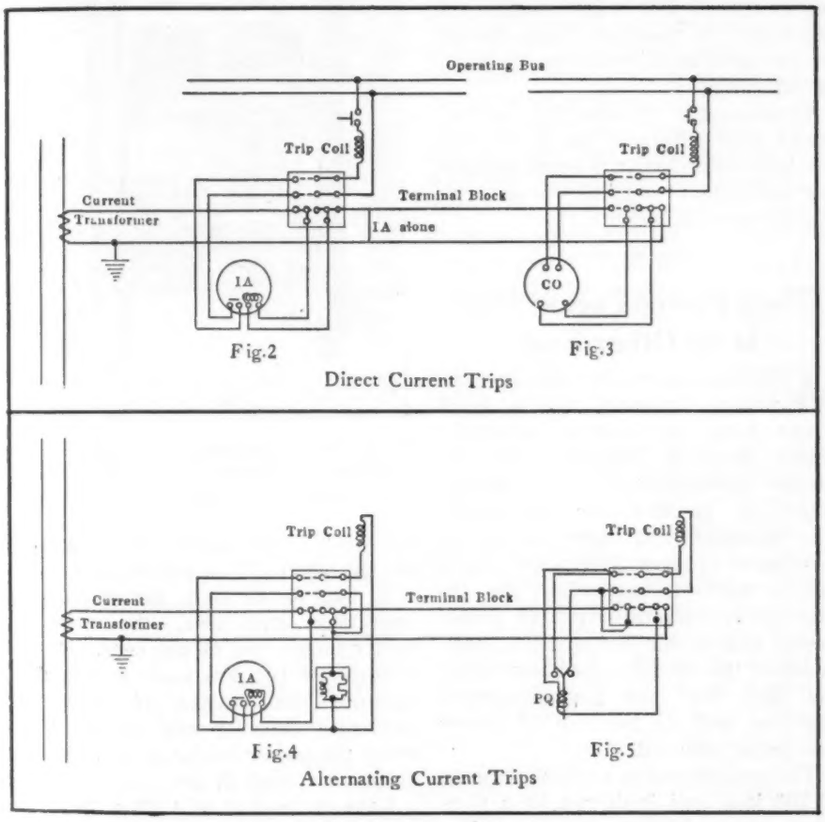


FIG. 1—PERSPECTIVE VIEW OF TERMINAL BLOCK



FIGS. 2-5—METHOD OF TESTING VARIOUS TYPES OF RELAYS

Figs. 2 and 3—Connections for type "IA" inverse time overload relay, direct-current trip circuit or type "CO" relay. Fig. 4—Connections for type "IA" inverse-time overload relay, alternating-current trip circuit. Fig. 5—Connections for type "PQ" circuit-opening relay, alternating-current trip circuit.

Permanent Terminal Block for Relay Testing

IN CONNECTION with the rewiring of portions of the relay panels on the switchboard of the Hartford (Conn.) Electric Light Company's South Meadow station a permanent terminal block for relay testing was devised by J. B. Millard of the company's engineering department. The block is remarkably compact, being only about 3 in. square, with a base about ½ in. thick, fastened to the back of the relay board panel by two screws. Eight blocks may be mounted on one 24-in. panel without producing cumbrous wiring, and the block connections are adapted to a variety of relay applications, including General Electric type "IA" and "PQ" and Westinghouse "CO" and "CR," in circuits arranged for direct-current and alternating-current tripping and circuit closing and opening.

The terminal block is designed to enable the various changes required in testing to be made by removing and inserting screws which fit holes in brass connection straps. These straps are seated in channels provided in molded insulating material having protective barriers between contacts at differing potential. Leads are connected to the binding screws *aa'*, *bb'*, etc., by hexagonal nuts not shown in the illustration. In the typical "IA" relay test (Figs. 2 and 6) terminals *aa'* connect with the relay coil, *bb'* with the current transformer secondary, *cc'* with the contacts on the relay-closing circuit and *dd'* with the tripping circuit.

Inserting the spare screw in hole 2 short-circuits the current transformer; removing screws 1 and 3 disconnects the relay coil from the circuit of the current-transformer secondary; withdrawing screws 4 and 5 disconnects for testing.

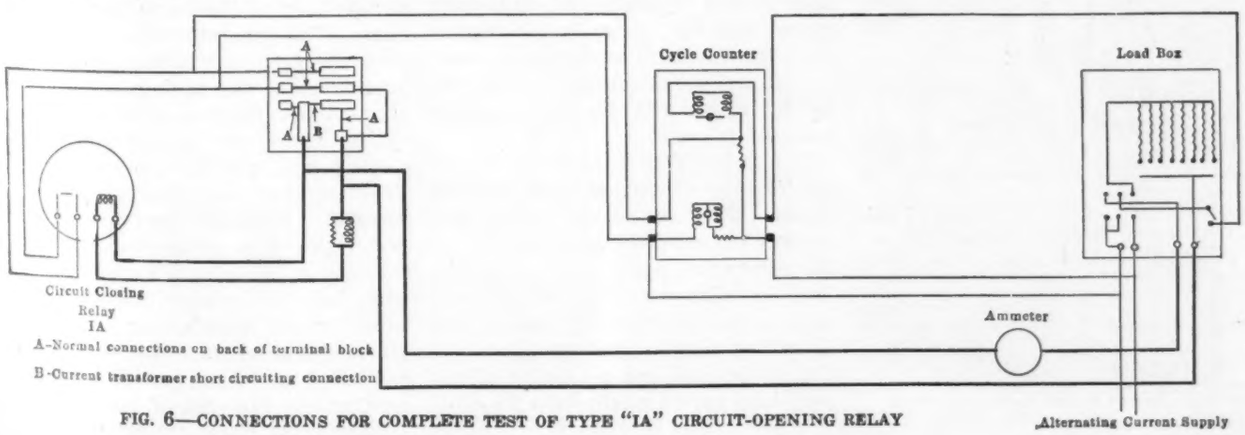


FIG. 6—CONNECTIONS FOR COMPLETE TEST OF TYPE "IA" CIRCUIT-OPENING RELAY

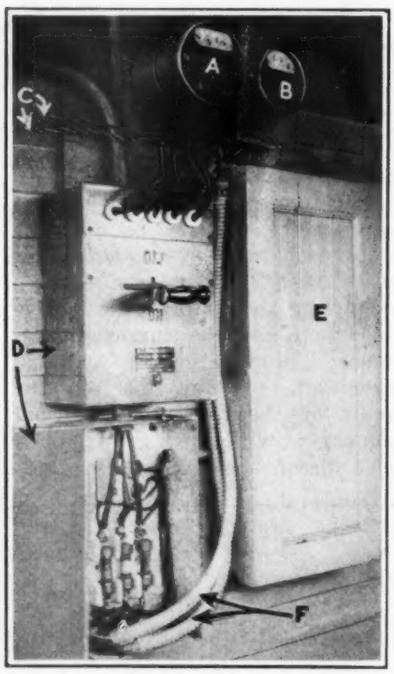
Central Station Business

Studying the Range Load in the Northwest

INVESTIGATION of the characteristics of the electric range load by the electric cooking and heating committee of the N. E. L. A. is going forward satisfactorily. In Seattle, Wash., tests are being conducted on the premises of electric range users. The "distant dial method," described in the May 10, 1924, issue of the ELECTRICAL WORLD, page 966, has been adopted. This provides for a standard watt-hour meter equipped with a special contact-making device in the register which by sending impulses over a low-voltage pressure circuit will register the summation readings of a group of watt-hour meters on one meter dial.

The equipment as installed on the customer's meter loop is shown in the accompanying illustration. No additional holes of any kind were made in the customer's walls or boxes, the test meter being screwed to a template board which was put under the regular meter screws. A special catch was put on the door of the range service cabinet to hold it in a slightly open position to permit the entrance of flexible conduit. Very few customers have made any objection to the installation, which is considered fortunate by the committee in that it will make possible the obtaining of complete data on all ranges used in a given section under investigation.

Considerable information has already been obtained, but it has not yet been compiled in a form suitable for intelligent analysis by central-station companies.



DISTANT-DIAL TEST INSTALLATION ON RANGE CUSTOMER'S BACK PORCH

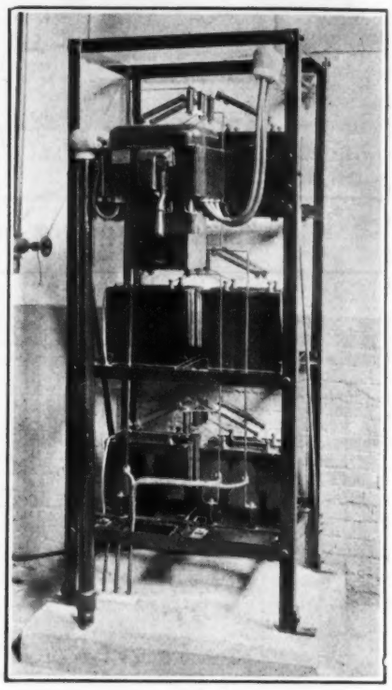
A—Seattle residence area regular service meter. *B*—Special test meter with distant dial. *C*—Duplex control leads hang loosely to edge of porch 3 ft. distant and span from there to pole alongside service drop. *D*—New and main branch cabinets installed by customer at time of putting in range. *E*—Old lighting service cabinet. *F*—Flexible conduit containing leads for looping the range circuit to test meter and back.

When Power-Factor Shoe Is on Other Foot

WHILE depriving the central-station company of a small power load, an isolated industrial power plant in Massachusetts recently demonstrated the economic value of power-factor correction. The circumstances surrounding the case serve to show that power users can be made to appreciate the advantages of maintaining high power factor, and in this instance the application of the remedy was hastened by the fact that the manufacturer's plant as well as his use of power was being affected.

The generator has a rated capacity of 150 kva. and is driven by a Corliss engine, which serves as a reducing valve as a great deal of steam is used at low pressure in the washing of material. The plant is equipped with a very complete and up-to-date layout and the owner is thoroughly alive to all costs of various processes. Steam mains are equipped with flow meters and a CO_2 flue-gas analysis machine is used.

It was found that the expansion of the factory demanded more electric power. The load on the station had already exceeded the kva. capacity of the generating equipment which had been installed, necessitating the purchase of power from outside sources. Thinking that a rearrangement of the motor load and a change of the peak-load period might help the situation, an investigation was made of the character of the entire plant load.



THIS STATIC CONDENSER RAISED POWER FACTOR OF 150-KVA. ISOLATED PLANT FROM 56 TO 80-85 PER CENT

It was found that, under normal operating conditions, the average power factor was 56 per cent. From a check of the kw. load, it was determined that 60 kva. of corrective condenser capacity was necessary to bring the power factor up to between 80 per cent and 85 per cent.

Late in the fall of 1923 a 60 kva., three-phase, 575-volt General Electric static condenser was installed on the power bus. The result was an additional kilowatt capacity of 40 per cent from the same generating plant. The generator had previously been operated at full kva. capacity, in addition to purchasing 25 per cent of the total energy consumed.

Under present conditions, using static condensers, the generator carries the entire plant load with ample margin. Although no tests have been made, it is certain that there is less loss in the generating equipment and that the exciter operation is much more satisfactory. In one year's operation the static condenser has saved in outside power bills approximately the cost of installation.

Threefold Rôle of New York's Annual Electrical Show

Marking Each Year's Achievements in Electrical Progress, It Extends Its Educational Benefits to the Public, the Utility Company and the Manufacturer

TO THE electrical industry New York's seventeenth annual Electrical and Industrial Exposition, just closing, represents another milestone in electrical progress that should be thoughtfully analyzed for its underlying benefits. This particular "electrical show," as it is popularly known, has assumed an aspect of national importance, for, without doubt, it stands as the pattern and goal for similar exhibitions throughout the country. It is more than just the show or business stimulator that it is frequently judged to be by the casual observer. In reality it constitutes an intensive educational institution whose advantages are equally enjoyed by a trinity of interests made up of the public, the central-station companies and the electrical manufacturers.

THE PUBLIC

From the public's viewpoint the Electrical and Industrial Exposition offers an opportunity each year to check up on the achievements of the industry and to study new developments and refinements in methods of utilizing electrical energy. In visiting the show the individual may examine and handle the devices on display, ask as many questions as he likes and pass on enriched by additional knowledge without being unduly importuned to buy or even to give his name if he has the slightest reluctance to do so. He is a free, unhampered guest of some member of the electrical industry, and here it might be stated that fully 90 per cent of those who flock to the New York "electrical show" do so on complimentary tickets. Not only does this guest of the industry learn what is new, but he is shown by working models the practical applications of electricity, how energy is generated, distributed and finally brought to him under perfect control for his particular needs.

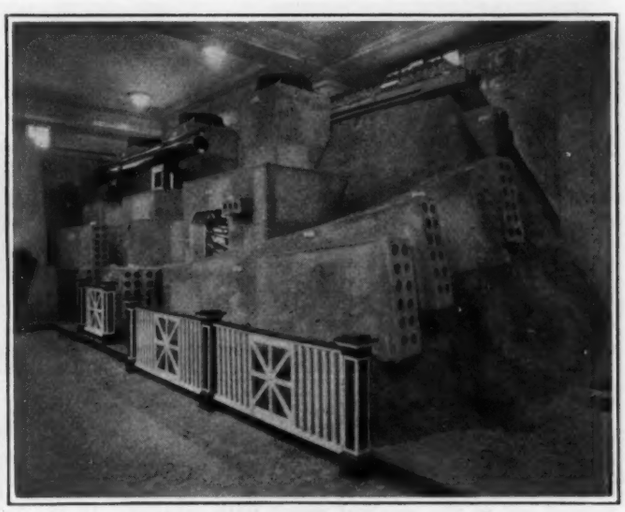
Greater than all else perhaps is his contact with the personnel of the industry. He comes to know this side of the service he receives and is brought to a realization that back of the automatic wonders of this electrical age is a large army of very human beings anxious to provide the means for higher ideals in living and greater economy and efficiency in commercial and industrial activities.

Nor are those who visit the electrical show representative of any one class of people. A careful scrutiny of the crowd discloses that it is a typical cross-section of the great city's population, including school children, parents and grandparents, from the lower east side to Park Avenue's most exclusive apartments. The potentialities of electrical progress that are evidenced when more than a quarter of a million people eagerly jostle each other through the ten days of the exposition are impossible to measure. The mere fact that the attendance is larger each succeeding year is proof enough of the public's appreciation of what the electrical show offers.

THE UTILITY

With the central-station companies the public relations standpoint is foremost; in fact, the improvement of public relations is the whole objective of such an exposition. Through their liberal distribution of tickets to customers and courteous invitations they create in a graceful way the impression that they consider it a duty and privilege to keep the public abreast of the times electrically. At the exposition the atmosphere of the business office is eliminated and the utilities become hosts to their customers and the public. Here again the educational feature is evident, for the central-station man can learn something more about the people he serves. The advantage to the utility is what its employees who man the exhibits learn about themselves, their jobs and their relation to the public. It might be termed inside education. At the show the utility employee gets away from his routine work; he comes in contact with men in other branches of the industry and has a chance to observe how they handle their visitors. He is put upon his mettle to make an equally good impression on his own visitors, and through this practical contact becomes a better trained and more valuable employee for his company.

That the central-station companies come to know more intimately the electrical manufacturers and distributors needs no emphasis. The co-operative and co-ordinated effort



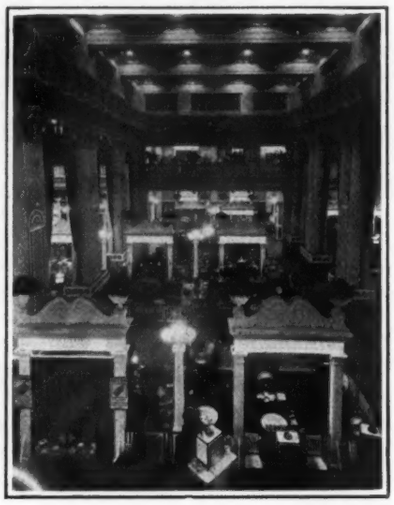
SPECIAL DISPLAYS AT NEW YORK ELECTRICAL SHOW. AT LEFT—THERAPEUTIC APPARATUS. AT RIGHT—UNDERGROUND CONDUITS IN NEW YORK STREETS

that must be put forth to make this exposition a success can only serve to make each more familiar with and considerate of the others' problems.

THE MANUFACTURER

Those who exhibit their products at the electrical show may be deemed its most direct and immediate beneficiaries through the sales they make and the prospects of future sales, besides the cumulative advertising effect upon the public. These are very tangible and concrete advantages that can be pretty accurately measured in the cash register. But inside education is again a most important consideration. Gathered together under one roof for ten days, exhibitors learn to appreciate the worth of their competitors as they could in no other way. The intimate personal contact serves to eliminate mud-slinging and deprecation of the "other fellow's" product, a practice which always has a most unfortunate reaction upon the public. Without infringing upon one another's methods and devices, they can study the latest developments in apparatus and make plans to bring their own lines up to the best standards in efficiency and ease of operation. It is a notable fact that every electrical show has been marked by improvements over the equipment exhibited in the previous year. This has been done with little or no hint of stolen ideas. Each manufacturer produces the best he can, and if he can trade ideas with his confrères, ultimate profit accrues to that trinity of interest—the public, the utility and the manufacturer.

Arthur Williams, a director of the New York Edison Company and president of the Electrical Show Company, sets a very high value upon these educational features. In his judgment the annual electrical show is the best thing the industry can do to promote co-operation in its own ranks and bring its value home to the mind of the public and of the individual utility employee. He points out that the number of exhibitors this year, 149, exceeds all former years. Millions of dollars' worth of electrical products are on display, and it has cost the exhibitors upward of $1,000,000 to transport, set up and exhibit their equipment. A still further measure of the educational value of the electrical show is the fact that the federal government has sent exhibits from Washington representing the Bureau of Engraving and the Army and Navy Departments, including chemical warfare and lighthouse demonstrations. The city of New York also has an extensive exhibit.



GENERAL VIEW OF ELECTRICAL SHOW

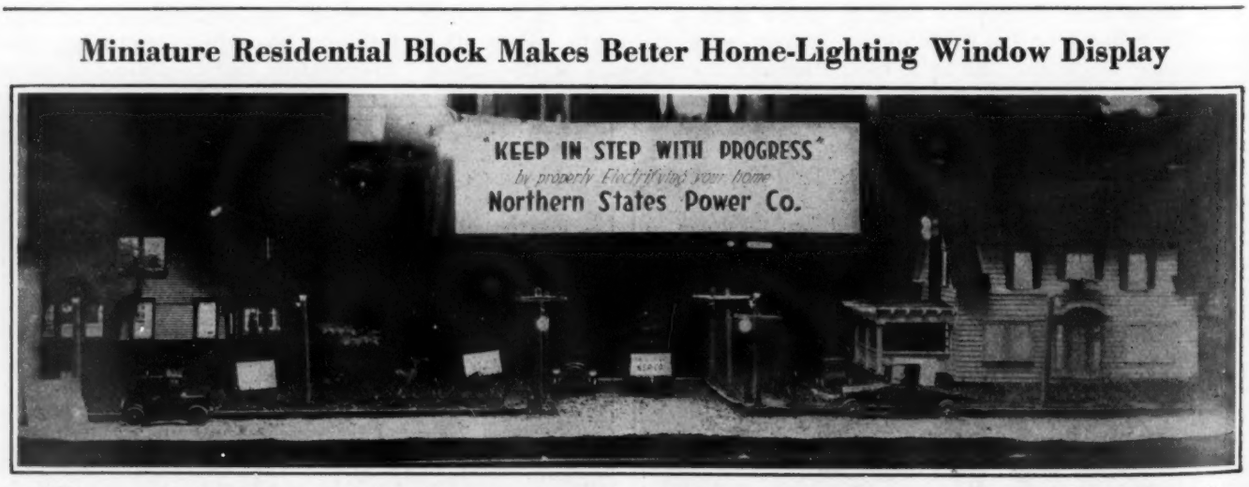
"When our federal government holds the educational value of the electrical show in such high esteem that it sends these exhibits and men to operate them," says Mr. Williams, "we do not need to look for any further proof of its value to our industry."

Appliance Sales Increase Over 1923

SALES of electric appliances by the Public Service Company of Northern Illinois during the first eight months of 1924 were considerably above the record of the same period of 1923, expressed in both terms of money and in number of appliances. The 1924 sales are led by flatirons, vacuum cleaners and washers. Following these with respect to money returns are toasters, percolators, grills, heating pads and curling irons.

Floor and table lamps have received increased attention from customers. This class of merchandise is a good income producer, although not in the same rank with the heating devices. The spread of the "better light" idea and the probable further widening of its support as a consequence of the better home-lighting contest are expected to stimulate the sale of portable lamps.

Miniature Residential Block Makes Better Home-Lighting Window Display



THE unusually good window display shown here is being used by the Northern States Power Company at its Eau Claire (Wis.) office. A city block in the residential section has been worked out in the smallest detail with miniature houses well lighted to show the proper use of electricity. Lawns, sidewalks, flowerbeds, driveways and streets have all been faithfully reproduced in the model and a miniature system of street lighting has been installed. In the background an attractive card reads: "Keep in Step with Progress by Properly Electrifying Your Home." M. S. Bandoli, sales manager of the company, who designed the display, says that it has been very helpful in stimulating interest in the national home-lighting contest, in which his company is an active participant.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Building a Hydro-Electric Plant on Saguenay River.—A hydro-electric development in two stations aggregating 1,200,000 hp. has been begun on the Saguenay River, which drains Lake St. John in northern Quebec. In the present construction the power house will be completed for twelve 45,000-hp. units, but at first only eight of the turbo-generators will be installed. The operating head will range from 120 ft. to 100 ft. In the second station the head will be twice as great. The article is in three parts, the first being in the issue noted, with the others to follow in subsequent issues.—*Engineering News-Record*, October 16, 1924.

Hydro-Electric Practice in Norway.—HENRY A. PULLIAN.—This article contains data on a number of power plants, observations on dam, tunnel and penstock construction, turbine efficiencies for low heads and high specific speeds, and methods of combating ice troubles.—*Power*, Sept. 23, 1924.

Hydrographical Investigations in Norway.—This booklet is prepared by the Norwegian Institution of Water Power and Electricity. It contains detailed information and maps of the most important rivers in Norway with reference to their properties for electric power development.—*Norges Vassdrags- og Elektricitetsvesen.*

Design and Maintenance of a 7,500-Kw. Central-Station Plant.—Under the caption of "Small Prime Movers," the prime movers committee of the N. E. L. A. has this year made a study of the design and the initial operating costs of a 7,500-kw. central-station plant. In order that the results obtained may be comparable with the results of similar reports for the past two years, one on a 200-kw. plant and the other on a 1,500-kw. plant, the same assumptions have been made as regards location of plant and price of coal and oil. Comparison is made of the generation of energy by the steam turbine and by the Diesel engine.—*Publication No. 24-76 of the N. E. L. A.*

Generation, Control, Switching and Protection

Behavior of a Discharger as a Lightning Arrester.—J. OKOCHI.—The author explains the behavior of a discharger when it is used as a lightning arrester. Although it is impossible to design a truly ideal arrester on the principle of a discharger, he shows that it is possible to design a lightning arrester by a combination of the principles of a discharger and of a high-frequency energy absorber. A high-frequency absorber as designed by the author is also described.—*Journal of the Institute of Electrical Engineers of Japan*, No. 432.

The Influence of the Power Factor on the Price of Electrical Energy.—This paper is a general review of the subject, applied to Norwegian conditions, and furnished by the N. E. V. F. (Society of Norwegian Power Stations) through its economics committee. The committee expresses as its opinion that there is no incentive for the average Norwegian power station to introduce a more complicated rate in order to take care of the inductive load. In special cases it is recommended, however, that the power stations introduce rates that will promote the improvement of the power factor of the load.—*Meddelelser fra Norske Elektricitetsverkers Forening*, August, 1924.

Transmission, Substations and Distribution

Transmission-Line Charging and Self-Excitation of Alternators.—M. TAKAHASHI.—With the development of high-voltage and long-distance transmission systems the line-charging current has been greatly increased. It is a well-known fact that when charging such systems the generator will sometimes be self-excited by armature reaction to an abnormally high voltage, which threatens the insulation of the system. The author describes the precise nature of the charging current on the line and of the action of the leading current in the armature. Results of actual tests on machines coincide with curves that had been developed for analyzing the line-charging characteristics and the saturation of the armature of a machine.—*Journal of the Institute of Electrical Engineers of Japan*, No. 432.

Alternating-Current Underground Distribution in New Orleans.—W. R. BULLARD.—This paper gives a technical description of the details of the new underground alternating-current system which is being installed in the business section of New Orleans, replacing the present direct-current system of distribution. The automatic network switch which is used in the installation is fully described. This switch automatically disconnects from the low-voltage mains all the transformer banks which may be connected to a particular high-voltage feeder when that feeder becomes short-circuited, thus preventing the network from feeding back into the short circuit. Alternating-current substations will receive power at 13,200 volts, where it will be stepped down to 4,000 volts, three-phase, four-wire, or 2,300 volts Y, which will be the distribution voltages. It is estimated that about thirty years will be required for the completion of the system, making allowance for the future growth of the business and industrial area of the city.—*Proceedings of Louisiana Engineering Society, Vol. X, No. 4.*

Power Transmission Line.—W. T. TAYLOR.—This is the third of a series of articles dealing with the determination of the various factors which affect the economic characteristics of the transmission line itself. Part III deals with the question of power loss and voltage drop and includes charts based on line reactance and resistance with practical examples fully worked out.—*Electrical Review (England)*, September 5 and 12, 1924.

Units, Measurements and Instruments

Creeping of the Induction-Type Watt-Hour Meter.—M. OYAMA.—The creeping of induction-type watt-hour meters is discussed and the various devices used for preventing creeping are described. The adjustment for creeping is explained with particular reference to its effects when the load is intermittent or is very light.—*Journal of the Institute of Electrical Engineers of Japan*, No. 432.

Connection of Three-Phase Meters.—H. ZIEMENDORFF.—When three-phase energy is to be metered in high-voltage lines, a great many varieties of wrong connections are possible, which result in readings either too high or too low, in the meter standing still, or, in general, in different torques of the meter in relation to the phase displacement of the line. Assuming that the instrument transformers are properly connected to the line and that they are grounded at the right points, there are 576 different ways to connect these transformers to the meters, of which only twenty-four connections are right. On every one of these twenty-four correct connections twenty-three wrong connections can be based. The author gives an exact explanation of each one of these basic twenty-three misconnections and shows graphically on twenty-three curves and in an elaborate tabulation what is wrong in each case and what the meter reads instead of the real indication.—*Elektrotechnische Zeitschrift*, Sept. 4, 1924.

Illumination

Design of Glass Paraboloidal Mirrors.—FRANK BENFORD.—After pointing out the importance of the silver-backed glass mirror on the score of durability, the author traces the paths of the several components of a searchlight beam due respectively to first-surface reflection, second-surface reflection and internal reflection between the two surfaces. To make the emitted rays coincide, the silvered surface from which some 90 per cent of the total light is reflected must be, not a paraboloid, but related to the front paraboloid in terms of the optical constants of the glass. Formulas are developed and their application is illustrated.—*General Electric Review*, September, 1924.

Furtherance of Good Lighting by American Central Stations.—J. W. LIEB.—This paper was presented at the International Commission on Illumination held in Geneva, Switzerland, in July. The author discusses the central-station view of electric lighting,

demonstration of advantages of good industrial illumination, lighting equipment and related subjects. — *Transactions of the I. E. S.*, September, 1924.

Motors and Control

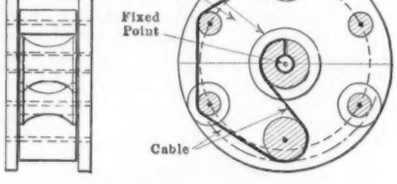
Selection of Ball and Roller Bearings for Electrical Machines.—T. D. TREES.—This paper has been prepared to indicate the line on which the selection of bearings should proceed in cases where it has been decided to employ ball or roller bearings for electrical machines. In order that due allowance may be made for bearings under different conditions of loading, it is suggested that some method should be adopted that would employ definite factors graded according to the service required, by means of which the capacity of bearings could be properly checked when necessary. It is not sufficient simply to use the makers' tables of safe loads for all purposes, and certain "load factors" are put forward in order to furnish a rational basis of comparison. In conclusion, observations of a general character are made with regard to capacities, costs, types, etc. A list of previous papers on the subject is given for reference.—*Journal of Institution of Electrical Engineers (England)*, September, 1924.

American Logging and Sawmill Safety Code.—This is one of the series of national safety codes formulated under recommendations to the American Engineering Standards Committee by the Safety Code Correlating Committee and developed under the plans and rules of procedure of these bodies. The code applies to all logging operations, including the transportation of logs to the mill; to the ordinary sawmill operations, including lath and shingle manufacture, but excluding the manufacture of veneer and cooperage stock, and to dry kilns and yard operations. The code has been prepared under the sponsorship of the Bureau of Standards and is approved by it.—*Handbook No. 5 of the Bureau of Standards.*

Heat Applications and Material Handling

Storage-Battery Locomotives for Mines. — T. KURAYAMA. — The paper gives the actual test data of the storage-battery locomotives in the Muke Colliery, one of the largest collieries in Japan. The locomotives have a total weight of 3.32 tons and the batteries have 187.5-amp.-hr. capacity at 80 volts. For comparison some data on trolley locomotives in the same mine are given. The author concludes with a discussion of the advantages and disadvantages of the storage-battery locomotives from the practical point of view. — *Journal of the Institute of Electrical Engineers of Japan*, No. 432.

Cable Drum for Portable Apparatus.—L. SABATIER.—Whenever a portable electrical apparatus—such as, for example, a hand lamp or motor—has to be connected to a stationary current outlet, sufficient flexible cable has to be provided to bridge the longest distance between the two. If the apparatus is needed at a shorter distance, it is desirable to keep the surplus of existing cable in some manner out of the way. The customary cable drum takes care of this problem, but such a drum requires as many collector rings and brushes as there are conductors in the cable. Even if well made, such collector rings may readily cause electrical and mechanical troubles. The author describes a cable drum which does not require movable contacts, giving two styles of design, which are, however, the same in principle. The drum consists of one or two fixed inside drums, surrounded by one movable outside drum. A certain length of the cable has to be kept upon the internal drum to compensate for the paid-out



CABLE DRUM FOR PORTABLE ELECTRICAL MACHINES THAT DOES NOT REQUIRE MOVABLE CURRENT CONTACTS

cable. Aside from the electrical advantages, the author mentions that this device is also excellently suited for hose reels in connection with gas welding torches or for handling liquids. —*Revue Générale de l'Electricité*, Aug. 16, 1924.

Electrophysics, Electrochemistry and Batteries

Studies of Electric Discharge in Gases at Low Pressures.—IRVING LANGMUIR and HAROLD MOTT-SMITH, JR.—Part III of a series, of which the preceding articles dealt with the theory of plane, cylindrical and spherical collectors (with retarding and accelerating fields) and with typical experimental data on the use of plane collectors together with a discussion of the visual observation of sheaths. The present article furnishes similar data for cylindrical collectors. Into a mercury-arc bulb of special construction cylindrical collectors of different diameters were inserted. From the observed data numerical values are deduced for the space potential, temperature of electrons, electron density, electron current density, positive ion density and ion current density, for various bulb temperatures, vapor pressures and anode currents. — *General Electric Review*, September, 1924.

Electrolytic Theory of Corrosion.—F. N. SPELLER and F. G. HARMON.—It is shown that the electrolytic theory is the best theory of corrosion known today. Many cases of so-called pure "chemical corrosion" have not been correctly interpreted. Accelerated corrosion tests must be very carefully carried out to avoid results that may be entirely different from the results obtained by ordinary low processes of corrosion.—*Paper presented before the American Electrochemical Society, Detroit*, October 2-4, 1924.

Traction

Future of Main-Line Electrification on British Railways.—H. E. O'BRIEN.—The author shows that the probable density of traffic in ton-miles on the main railway arteries is so great that the cost of energy, including all capital charges, will not be prohibitive; also that the cost of the electric locomotives will not be a capital charge, and, further, that when the reductions in the cost of locomotive operation and maintenance (due to the simple construction of the electric locomotive) are taken into account, the total cost of locomotive operation is substantially less for electricity than for steam. The conclusion, though it has only been possible to base the argument on general statistics, is that the problem merits closer and more immediate investigation than has hitherto been accorded to it.—*Journal of Institution of Electrical Engineers (England)*, September, 1924.

Locomotives for South African Railway.—A late development in main-line electrification is that of the section of the South African Railway from Glencoe to Pietermaritzburg. This section is used largely for heavy mineral traffic down to the coast. The track has a route mileage of 171 miles, traversing very hilly country with long and difficult grades. Seventy-eight combined passenger and freight locomotives, designed for use on narrow-gage lines, are to be used. Owing to the limitations of the track, three engines will be coupled together to be driven in multiple from one driver's cab. The overhead contact wire is of the catenary type, designed for 3,000 volts, direct current. — *Electric Railway Journal*, September 13, 1924.

Miscellaneous

Oil Purification. — H. STAGER.—The purification of insulating oil in high-voltage power stations is being accomplished by either filtration through specially designed filter presses or, lately, by centrifuges. Many years of experience with the former method and exhaustive theoretical and practical investigations of the centrifuging system lead the author to the final conclusion that the centrifugal purification method is distinctly inferior to properly made filtering. It is shown in particular why it is impossible to remove all the water which may be contained in contaminated oils. Centrifugal force cannot separate water particles which are of less than a certain critical size, but particles of much smaller size are the ones which are the most detrimental to the dielectric strength of oils. A further aggravating circumstance is the fact that oil is being heated before centrifuging. At higher temperatures oil is much more hygroscopic and takes in solution additional water. Claims made that acids are removed from the oil by centrifuging are obviously unsubstantiated, because it requires chemical means to remove acids. This can be readily demonstrated by an analysis of the oil before and after centrifugal treatment.—*Bulletin Association Suisse des Electriciens*, August, 1924.

News of the Industry

C. M. Schwab Addresses Power Club

Favors Complete Electrification of Steel Mills—Need for Improved Selling Methods Is Urged by President Timmerman—Activities of Transformer Section

WITH an attendance second only to that of its banner meeting at Absecon, N. J., last spring, the Electric Power Club held its fall meeting at the Greenbrier Hotel, White Sulphur Springs, W. Va., this week. In its sixteen years of work the club has advanced technical standardization in a noteworthy manner, and in view of accomplished facts along this line of endeavor, and with the old 40-50-deg. rating question quiet, much attention is now being paid by the members to methods and instructions in the operation of electric power equipment, to the servicing of equipment in use and to the problem of obtaining the most extensive adoption of standards by the buying and consuming public and industry. The Transformer Section, for example, whose instruction book on power transformer operation and care has proved so popular, is planning to issue a similar book on distribution transformers. The new method of printing the Power Club standards in a book separate from the organization handbook of the club has resulted in a wider distribution of the former with consequent greater knowledge of the club's standards on the part of buyers.

Presidential Address

In his presidential address A. H. Timmerman asked the club what had been accomplished by it with reference to reduction of selling costs and improvement of business practices in selling equipment. There have been concrete and large benefits from standardization and from better manufacturing methods in the direction of lowering manufacturing costs, but the industry itself, Mr. Timmerman said, has not received the benefits from these, but has on the contrary passed them on to the extent of about 105 per cent to the consumer and purchaser. What is needed in the electrical manufacturing industry on the part of the individual manufacturer is improvement in selling methods to reduce the cost of selling and distributing equipment and also an effort toward better business practices in general as an aid to more stable business. This is also the greatest thing that can be done in the interest of the consumer. Mr. Timmerman discussed both the ethics and the good business practice of certain methods of dealing with purchasing agents, particularly with reference to the changing of quotations from the original figure. He pointed to other industries where better business practices had been developed—older industries than the electrical—to show that both the industry and the consumers benefited therefrom.

Charles M. Schwab addressed the club on Tuesday and sounded a note of optimism and definite encouragement with reference to the industrial future in America and the opportunities of the electrical industry in the coming expansion. In his forty-five years of active industrial experience, he said, he had never seen a steel mill built large enough to meet the demands later made on it. When a record of 150,000 tons of steel per year in 1879 turned to one of 12,000,000 tons in 1912, Andrew Carnegie thought the peak had come, but the present rate of 40,000,000 tons shows how far he was wrong, and the curve is still upward. With America the workshop of the world and with the use of power pointing the way, the electrical industry has the greatest opportunity of all in this future growth. Industry must fully electrify, said Mr. Schwab, and he, in the steel industry, had decided that he will build no more mills not electrically operated. Mr. Schwab declared that his experience had shown that destructive competition is ruinous to an industry and costly to the public. Only a prosperous industry has the means to develop new methods of production, resulting in lower costs and better equipment. If the steel business had not been profitable, it would never have developed. Having profits, an industry can introduce economies which an unprofitable business finds impossible.

F. M. Feiker, vice-president Society for Electrical Development, told of the general work of the society and in particular of its efforts along commodity lines. He presented, at the request of the club, some specific ideas with reference to development of a greater market for electrical tools.

Overcoming Sales Resistance

Malcolm Muir, vice-president McGraw-Hill Company, addressed the club at the banquet on Wednesday evening on the subject of breaking down sales resistance for electrical equipment. He showed, from the results of extensive surveys in industry, the logical classification of its divisions and the channels of approach and methods of appeal which the surveys have proved to be the ones that buying industry itself says it uses or which appeal to it.

Francis E. Neagle, counsel to the Power Club, gave an interesting discussion of the law and its interpretation regarding what was legal and proper and what was not legal for associations of manufacturers to do. The tendency in the development of the law and its interpretation, he showed, is for the greatest and most effective protection of the interest of the public—the buyer.

In technical lines the only definite new standards of special interest are the preferred ratings for three-phase distribution transformers adopted by the Transformer Section. The Motor and Generator Section took action with reference to some additional definitions, and the entire club approved certain abbreviations for submission to the joint committee on the subject. An amended report on shaft, bearing, pulley and belt size calculation and standardization was presented. Two new members were admitted to the club, C. J. Anderson & Company and the Master Electric Company. It is planned to hold the next meeting of the club at Hot Springs, Va., next May.

Competition at Holyoke?

Local Company Sees Invasion of Territory in Proposed Outside Purchase of Railway Plant

A MOVE made by the Turners Falls Power & Electric Company with the alleged purpose of entering the Holyoke (Mass.) field through purchase of the Holyoke Street Railway Company's power plant on the Connecticut River bank is interesting industrial and business interests in that section. The issue came to a head last week when the Turners Falls company petitioned the Massachusetts Department of Public Utilities for authority to increase its capital stock to enable it to extend its facilities and Robert E. Barrett, president of the Holyoke Water Power Company, demanded that the Public Utilities Department investigate the alleged transaction between the Turners Falls company and the car company and see that the Holyoke company's rights in the territory were protected.

The immediate purpose of the Turners Falls company's application, it was stated, is the purchase of the car company's power plant under a contract agreement providing for the sale to the car company of the energy it needs to operate its system. At a hearing before the commission in Boston on Tuesday, however, W. R. Peabody, counsel for the Turners Falls company, declared that no contract had been signed between the Holyoke Street Railway and his company, but that the railway company had asked the Turners Falls company to discuss the supply of additional power for railway service. He denied that the Turners Falls company had acquired the railway power plant in Holyoke and intimated that the future supply of electricity to the Holyoke traction system depends in large measure upon the ability of the railway company to secure advantageous terms from an acceptable bidder.

Former Mayor Nathan Avery of

Holyoke, on behalf of the Holyoke Water Power Company, objected to the possible entrance of the Turners Falls company into Holyoke on the ground that ample facilities already exist for energy supply. He urged the commission to restrict the application of the proposed additional stock to past expenditures for capital and not to permit any part of the proceeds to be devoted to the proposed purchase of the street-railway plant. The commission let it be understood that its action of necessity would be confined to the stock issue as based upon the exhibits of outlays and commitments already incurred.

The municipal authorities were stirred over the situation, not only because of the Holyoke Water Power Company's close identity with the city's industries, but because it was feared that the entrance of a new competitor would work injury to the business of the municipal gas and electric plant, with which the Holyoke company works in close agreement. The proposed deal with the car company is looked upon as an entering wedge that will bring the Turners Falls company in as a competitor for other business. The Holyoke Water Power Company, on its part, has spent large sums in extending and developing its business and is prepared to contest what it regards as an invasion of its territory.

The city solicitor has reported to the Mayor that so far as he can discover there is no legal barrier to the Turners Falls company's taking over the car company's power plant and its existing transmission lines without consulting the city authorities.

Electrical Exporting Discussed by Manufacturers

Among the important addresses made at the fifteenth annual convention of the American Manufacturers' Export Association, which was held at the Hotel Commodore, New York, on Wednesday, October 22, was one on "Electrical Exporting" by E. D. Kilburn, vice-president Westinghouse Electric International Company, New York. Mr. Kilburn pointed out the need for creative salesmanship in the development of foreign electrical markets and said that in many countries there is little or no market for electrical goods, and if the American exporter desires to find outlets for his products, he must carry on promotion work for many years, just as has been done in the United States. He said that American export business should not be conducted for immediate and quick results. The job should be handled in a constructive way and not be undertaken merely as an effort to speed up when domestic business is slow.

W. W. Nichols, president of the association, reported on the recent American industrial mission to Mexico, of which he was the head. "Mexico," he said, "has, intensified, the same range of problems we find in our own land so utterly bewildering and beyond our solving. This merits our serious meditation, and we suggest that if we manifest a sympathetic comprehension of the heavy burdens borne by our Mexican neighbors and at the same time give evidence of a willingness to help, they might invite our assistance in more ways than by furnishing capital. Certainly, by assisting them our own situation would be greatly benefited, and, what is much to the point with us here, our Mexican trade relations would be on an enduring basis."

F. H. Booth, vice-president of the Guaranty Trust Company, New York, gave a "keynote" address on foreign trade, and other speeches covering different aspects of selling in the world's markets were made.

Skinner Nominated for President of A. I. E. E.

A petition circulated at the Pacific Coast convention of the American Institute of Electrical Engineers at Pasadena, Cal., last week for the nomination of Charles E. Skinner for president in 1925-26 met with the spontaneous and unanimous support of the delegates in attendance. It will be remembered that this year both Mr. Osgood's name and that of Mr. Skinner were placed on the ballot by the directors because of the evenly balanced support accorded them in the preliminary ballot and that Mr. Osgood's majority at the May election was only 271 in a vote of 7,540.

C. E. SKINNER

Mr. Skinner, who is assistant director of engineering with the Westinghouse Electric & Manufacturing Company, was born in Ohio in 1865 and is a graduate of the Ohio State University. He has been with the Westinghouse organization ever since his graduation, and his record there has been one of continuous accomplishment. He organized the research division of the company in 1906 and was in charge of it until his present office was conferred upon him. He has represented the A. I. E. E., of which he is a fellow, on the International Electrotechnical Commission, having been chairman of the American delegates to the Brussels meeting in 1920. He has also represented the Institute on the American Engineering Standards Committee, the American Engineering Council and other bodies. He is a member of the Franklin Institute, the American Physical Society and the American Society for Testing Materials and was a member of the National Research Council in 1917 and 1918. In Institute activities he has served on the committees dealing with editing, education, electrophysics, public policy, research, safety codes and standards and has also belonged to the executive committee and the committee on award of the Edison medal. He was a manager of the Institute in 1915-1919 and vice-president in 1919-1920.

Electrical Show Surpasses All Previous Records

Open from October 15 to 25, the seventeenth New York Electrical and Industrial Exposition has enjoyed an unprecedented success this year. The total number of exhibitors, 149, exceeded those of any former electrical show, and from the manner in which attendance figures were piling up on Thursday of this week it was expected that this total would reach the 300,000 mark.

A feature of the show this year was an exact replica of the fifteen-thousand-dollar home, illustrated on page 880 of this issue, which has been offered as first prize in the better home-lighting contest. It was erected by the United Electric Light & Power Company to help stimulate interest in the contest among the school children of New York City. Nearly three thousand people passed through the house every day, and this number would have been much larger had the fire regulations permitted a greater number in the house at one time. About twelve hundred school children were registered daily for the essay contest.

The general display of electric domestic appliances this year has showed a marked tendency on the part of manufacturers to fit their products to the needs of the average American home. Models exhibited showed more compactness, greater simplification, a trend of design toward the necessity rather than the luxury basis, and lighter, less expensive devices were in evidence.

One of the interesting features of the exposition this year was the commemoration of the forty-fifth anniversary on Tuesday, October 21, of Edison's invention of the incandescent lamp. Mr. Edison himself visited the Electrical Show on the Saturday preceding, when he inspected all of the exhibits, being particularly impressed with the electrical home and the contest idea. Electric light and power transmission by wireless, he said, was surely coming in the future, but "there is no cause to believe that it is immediately at hand." He spoke of the tremendous advances in lighting, and with the scientific diffusion of light he declared the coming generations had a far better opportunity of enjoying normal eye health.

Ford's Withdrawal and Muscle Shoals

Situation Altered by the Elimination of Detroit Man's Bid—Fear of Delay Causes Opposition to Commission of Inquiry—War Department May Take Charge

THUS far in the consideration of the disposition of the government's properties at Muscle Shoals chief attention has centered on the Ford offer. Such consideration as has been given alternate propositions has been entirely incidental to the analysis of the Ford offer. As a result of the withdrawal of Mr. Ford's proposal a situation is created in which there is little crystallization of opinion in official quarters as to which of the alternatives is best.

At the White House it was stated that the President still is of the opinion that a determination of the matter can be approached best through a commission to be composed of a sub-committee of the Senate committee on agriculture, which has jurisdiction in the Upper House, and a sub-committee of the committee on military affairs, which has jurisdiction in the Lower House of Congress. Secretary Hoover, realizing the difficulty of reaching a businesslike determination of an engineering problem by a political commission, suggests that an "objectively minded and skilled" committee also be employed. It is assumed that such a committee would act in a consulting capacity for the congressional commission. It was emphasized at the White House that the disposition of this property is a congressional and not an executive matter.

Some opposition to the commission idea is expressed by those who fear that such a procedure will inevitably result in withholding the property from utilization for a year or more after it is ready to deliver power. Some are of the opinion that a better way to handle the matter would be to vest full responsibility for the working out of the problem in Secretary of War Weeks, who is recognized as possessing unusual business ability. The Corps of Engineers, which built the dam, could operate it without any important excursion into government operation. With the assistance of the Chief of Engineers, the Chief of Ordnance and such outside advice as he would summon, a prompt determination could be made as to the disposition of the power. Secretary Weeks has made it clear that he would not hesitate to make temporary disposition of any portion of the power for which he could find a bidder. It is believed, however, that there will be no temporary market for more than 30,000 kw., which is the capacity of the only transmission line connecting Muscle Shoals with its tributary territory. This simply would be a substitution of hydro power for an equivalent amount of power now being transmitted from the steam plant at Sheffield.

Position of Southern Companies

Another suggestion is that a corporation composed of the Southern power companies should be allowed to make an application for rights under the water-power act. Ever since the Muscle Shoals project was begun these companies have been faced with a difficult situation. They have been confronted on one hand with a rapidly increasing demand and on the other hand by the uncertainty as to the steps which they should take to meet the demand. If the power to be developed at Muscle Shoals were going to be made available for general distribution, it was apparent that it would not be in the interest of these utilities, or of the public, to proceed with the development of projects which in that case would not be needed for some years hence. This state of uncertainty has now reached an acute stage. The Alabama Power Company, for instance, cannot determine a policy as to the development of the Tallapoosa until the disposition of the Muscle Shoals power is known.

It will be a matter of very general concern in half a dozen states if this period of uncertainty must extend for another two years. To avoid that the trend of opinion seems to be toward allowing the whole problem to go to the Federal Power Commission. Since the matter of fertilizer is involved, it would be a comparatively simple task for Congress to direct the commission to reserve a certain amount of the power to be utilized for that purpose. If there are any other special conditions which Congress wants observed, they could be embodied in the legislation. It is thought that such a bill could pass, particularly if it had the support of the administration.

Power and Fertilizer

There is an increasing tendency to think that the power and the fertilizer interests at Muscle Shoals should be divorced. It is becoming more and more evident that great difficulties confront the commercial manufacture of fertilizer at Muscle Shoals. One of the reasons thought to have been responsible for the withdrawal of the Ford offer was the realization that the No. 2 nitrate plant could not be used for the manufacture of fertilizer, though a still stronger motive is seen in the dwindling of the enthusiasm with which the Detroit manufacturer's bid was first hailed by politicians and the American Farm Bureau. There is now very general concurrence in the view that the government has lost only its lowest bidder.

The plant at Muscle Shoals will, it is anticipated, be ready to deliver power on June 15, 1925. If Congress should refuse to delegate the responsibility of handling the problem either to the Secretary of War or to the Federal Power Commission, the necessary legislation might have to go over until the session of Congress which would meet in December of next year. If the present administration is returned, there probably will be no extra session of Congress. In the event of a change in administration an extra session would be a certainty and earlier congressional action might be secured, but even then a certain amount of delay would be inevitable.

In all probability the Senate will recommit the Norris bill, which is on its calendar. Although there was considerable support for this measure when the principal purpose was to head off the Ford bill, there would be little chance of putting this legislation through the Senate and less of putting it through the House under existing conditions.

President Coolidge Wants Ford to Maintain Interest

In answer to a letter from Henry Ford announcing his withdrawal of his Muscle Shoals bid, President Coolidge wrote him under date of October 18: "On account of the delay and probable shifting in conditions, I can understand how you may feel justified in not keeping your offer open for a longer period. I trust, however, that should the Congress conclude that it is best to restore this property to private ownership, you will at that time renew your interest in the project." Mr. Ford, however, is quoted as saying that he is out of the Muscle Shoals situation permanently.

Loveland Wins Again

Colorado Supreme Court Upholds the City's Right to Build Plant Despite Commission

THE Colorado Supreme Court on Monday of this week handed down a decision giving the city of Loveland the right to erect a municipal light and power plant and declared that the Public Utilities Commission of the state, which fought the erection of the plant, has no jurisdiction in such cases. The decision ended a long court fight over the construction of the plant, a bond issue for which was sanctioned by the Loveland electors more than a year ago. Construction was started early this year and, as previously reported in the ELECTRICAL WORLD, has been continued regardless of litigation.

In its decision the Supreme Court sustains the lower court in holding that the Public Utilities Commission cannot interfere with cities which are under the home rule provision of the state constitution in regard to public utilities. Although the legal technicalities on which the appeal was taken did not demand such a decision, the Supreme Court, with all justices participating in special session, went into the case on its merits and decided it on that basis rather than on the application which was made for supersedeas.

Construction of the plant was fought by the Public Service Company of Colorado, successor to the Western Light & Power Company, on the ground that the community was already receiving from it cheaper light and power service than could be had from a municipal plant. With this contention the Public Utilities Commission was in accord, and therefore, it refused to issue a certificate of convenience and necessity. Attorney-General Wayne C. Williams refused to enter suit to enjoin the city. Whether or not the municipality will take over the present distribution lines and the plant of the company now serving it is not known.

Schools Support Contest

Co-operation of Educational Authorities in Better Home Lighting Assured

THAT the better home-lighting contest is assured of success is no longer in doubt if detailed reports from about two hundred communities can be taken as an indication of the interest it is exciting throughout the United States and Canada. These reports are from virtually every state and province and without exception they are to the effect that the results being obtained after the actual distribution of primers and other literature far exceed expectations.

A remarkable fact is that almost invariably the school authorities of the towns are co-operating to the fullest extent. A month ago there was considerable question in the minds of the regional directors of the Lighting Educational Committee and others whether the contest was so constituted as to be suitable for school co-operation. At this time indorsement had been obtained in a few cases, and copies of letters of indorsement were broadcast to the various communities which had some hesitancy in presenting the campaign to local school authorities. Now it seems that not only is indorsement given by local school authorities but that active assistance is had from the superintendents, principals and teachers of schools. This holds true in the private and parochial as well as the public schools.

Every day reports are received from regional directors of additional towns that are organized to hold contests. On Wednesday of this week reports of communities organized totaled 4,428, or nearly three times the original estimate of 1,500.

Joint Committee for Business Discusses Plans

Meeting in New York City on October 16, the Joint Committee for Business Development resolved that the chairman should be elected at the annual meeting, to be held about January 15 next, from the membership of the committee. The secretary will be appointed at the same time. Frank W. Smith of New York and Walter H. Johnson of Philadelphia were elected members at large. These moves were in accordance with the nominating and program committee's report, on which further action was taken as follows:

A committee was authorized which will gather information on dates, location and character of electrical conventions with the idea in view of reducing their number.

It was resolved that the report of the trade policy committee of the Association of Electragists International, together with a copy of the address of W. R. Herstein at the 1924 convention of this body, be sent to the members of the Joint Committee for Business Development with a letter embodying the suggestions of the nominating and program committee and a request that the address and report be studied prior to their discussion in January.

Committees of one on the activities of the Electric League Confederation and on the use of illuminated poster boards for national advertising were authorized.

A "uniform ordinance" committee of five, to submit a recommendation of ways and means of obtaining the support of the industry in the matter indicated, was also authorized, as well as a publicity committee of two. The nominating and program committee was asked to assume the duties of a budget and organization committee. M. T. Gleason is chairman of the nominating and program committee, and the other members are S. L. Nicholson, Fred R. Smith and G. E. Cullinan.

California City Defeats Plan for Municipal Power House

The voters of Anaheim, Cal., on October 18 defeated a bond issue of $240,000 by a vote of 903 to 626. This was a proposal to install a municipal steam-electric plant and was watched with considerable interest throughout the state in view of the water and power act which will be submitted at the general election on November 4. Anaheim for several years has had municipal distribution, but purchases its power wholesale from the Southern California Edison Company.

"Edison Night" on the Radio Widely Enjoyed

Thomas A. Edison was last Tuesday evening among the listeners to the radio celebration of the forty-fifth anniversary of his first successful test of the incandescent electric lamp. This celebration was carried out by the General Electric Company in a dozen or more cities in various parts of the country and was everywhere a popular part of the program put "on the air" on that evening. The speeches for which Mr. Edison's set was tuned in were made by Charles A. Coffin, the first president of the company; Vice-president J. R. Lovejoy and C. W. Stone, manager of the lighting department.

Injunction Against De Forest Company Dismissed

A decision which was interpreted in radio circles as permitting competition in the manufacture and sale of wireless apparatus was handed down on Wednesday, October 22, by Vice-Chancellor Vivian M. Lewis in Trenton, N. J., when he dismissed a temporary injunction obtained by the Radio Corporation of America against the De Forest Telephone & Telegraph Company. The injunction was obtained by the Radio Corporation on April 13, 1923. The effect of the decision, as interpreted in the daily press, is to permit the De Forest company to manufacture and sell parts of receiving sets without having its selling policy in any way dictated by the Radio Corporation; in other words, without any selling obstacle imposed by a rival organization.

The suit was brought to compel the De Forest company to obtain a written agreement from every purchaser or lessee that the apparatus neither as a whole nor in any part would be used in the commercial transmission or reception of messages "for pay," or used by others than the original purchaser or lessee, or for any other purpose than radio communication.

Municipal Electricians Discuss Street Lighting

The twenty-ninth annual convention of the International Association of Municipal Electricians was held at the Partridge Inn, Augusta, Ga., on October 14 to 17, with an approximate attendance of 170. The meeting was presided over by President J. L. Caldwell of Colorado Springs, Col.

A paper on "Special Street-Lighting Problems," by L. A. S. Wood, illuminating engineer, Westinghouse Electric & Manufacturing Company, South Bend, Ind., met with great appreciation. The axiom "Business follows light" and the difficulties of modern traffic conditions were two of Mr. Wood's arguments for better street lighting. He said that the subject involved not only a study of illumination and the artistic characteristics of the units, but also a very complete study of methods by which the systems may be financed. Asserting that the central-station companies in many cases are unwilling to undertake the financing of ornamental street-lighting systems, Mr. Wood's opinion was that municipalities should own the street-lighting units and the underground distribution system and either purchase energy in bulk from the public utility company, undertaking the maintenance of the system themselves, or purchase energy and maintenance from the public utility company.

In a paper on "Grounding on Secondary Circuits," Dr. M. G. Lloyd, electrical engineer and chief of the safety section, Bureau of Standards, Washington, recommended that the neutral on the secondary side, as well as the transformer case, be grounded and also that where the primary consisted of a four-wire, 4,000-volt service the neutral be thoroughly grounded.

Street lighting, police and fire alarm signaling and traffic signaling were the principal subjects handled at the meeting, and interesting papers were presented by W. C. Well, assistant sales manager Union Metal Company, Canton, Ohio; C. W. Mackall, the Crouse-Hinds Company, Syracuse, N. Y.; D. J. Morgan, assistant sales manager Hazard Manufacturing Company, Wilkes-Barre, Pa.; A. F. Dickerson, chief engineer illuminating engineering laboratory, General Electric Company, Schenectady, N. Y., and others.

A noteworthy feature of the convention was the exhibit. Virtually every electrical contrivance used by fire and police alarm systems in the country was on display.

Jacob Grimm of Buffalo, N. Y., was elected as the next president of the association, and Detroit was selected as the next meeting place.

Progress in Texas

Summary of Extensions and Interconnections Now Under Way—Growth of High-Tension Lines

AS A RESULT of the extensions and development of the power transmission system of the Texas Power & Light Company of Dallas, the consumption of electricity in northeastern and central Texas, covering an area 336 miles east and west and 232 miles north and south, has increased 500 per cent during the last ten years, according to C. E. Calder, president of the company. The total length of the power transmission lines of the company is now approximately 1,700 miles, as compared with 200 miles ten years ago, he said.

Mr. Calder announced that the Texas Power & Light Company and subsidiaries are now planning to spend $10,000,000 of new capital in constructing various transmission and distributing lines and plant facilities. He pointed out that the company has completed extensions to its central transmission system from Corsicana to Tyler by way of Athens and from Athens to Palestine. This line passes through the oil fields adjacent to Corsicana and through it much power is supplied for oil-field operations.

Construction is under way of a high-tension central transmission line between Hillsboro and De Leon, where connection will be made with the transmission lines of the Oil Belt Power Company from Eastland. This line, which will be 104 miles in length, will be operated at 132,000 volts—more than twice the voltage of any line now or ever before in service in Texas. It will be completed by December 1. Before January 1 the company's new central transmission line extension between Dallas and Sunset, in Montague County, by way of Denton and Decatur, will be completed. This line will connect at Sunset with the transmission lines of the Wichita Falls Electric Company that come southward through Henrietta and Bowie.

An extension of the central transmission system of the company has just been completed eastward from Terrell to Edgewood, in Van Zandt County. At some time in the future it is likely that the electric industries centering about Marshall will make connection at Edgewood with this line. Connections are being made between the Wichita Falls Electric Company and the West Texas Utilities Company at the southwest corner of Baylor County; between the West Texas Utilities Company and the West Texas Electric Company at a point between Trent, in Taylor County, and Sweetwater, and between the Oil Belt Power Company and the West Texas Utilities Company by building between Cisco and Eastland.

These extensions and interconnections of electric transmission systems will tie together several systems with a total output of electricity amounting to 500,000,000 kw.-hr. a year. Generating plants that will be connected with this interconnected system are located at Sweetwater, Abilene, Eastland, Cisco, Wichita Falls, Brownwood, Paris, McKinney, Dallas, Fort Worth, Waco, Temple, Taylor, Palestine, Tyler and a number of smaller places.

Mr. Calder emphasizes the fact that this interconnection of electric power and light plants is a measure of efficiency and insurance against interruptions in service and has nothing to do with ownership of the properties connected, the several larger companies involved in the arrangement each having distinct corporate existence, widely diverse ownership and independent management.

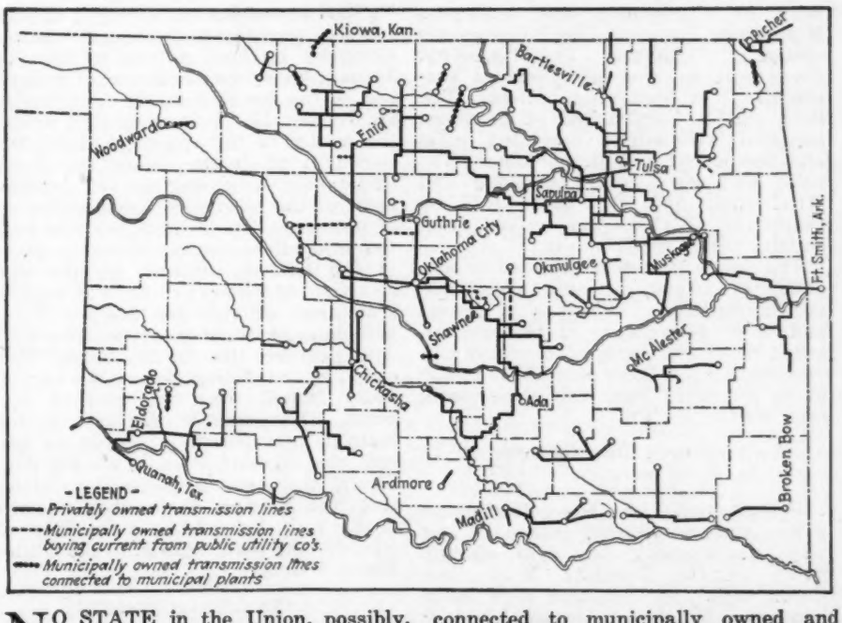
Foundrymen Meet to Discuss Electric Furnaces

More than two hundred foundrymen attended the electric furnace session of the American Foundrymen's Association held at Milwaukee on Wednesday, October 15. Two important papers on electric furnace operation were presented. E. L. Wilson, Hartford, Conn., discussed the problem of producing synthetic gray iron from steel scrap with both acid and basic linings as compared with cupola operation. At the Connecticut Electric Steel Company's factory an energy consumption of 637 kw.-hr. was obtained with acid linings when producing more than 500,000 lb. of cast iron varying in carbon from 2.2 to 3.4. He declared that synthetic gray iron can be produced with electric furnaces at a price equal to or lower than that for cupola operation.

James T. Mackenzie, American Cast Iron Pipe Company, Birmingham, Ala., told of his experiences with electric furnace using scrap, which increased operating difficulties. Acid linings were first used with poor success so a change was made to basic, but the price differentials between pig iron and scrap were so reduced by March, 1921, that it was not economical to operate the electric furnace and it was shut down.

G. K. Elliott, Cincinnati, outlined the principal differences between acid and basic electric furnaces, saying that greater absorption of carbon, superior refining quality and lower power consumption are the outstanding advantages of basic furnaces. J. F. Lamb, Washington, told his experiences when operating alternate charges of iron and steel. Difficulty was first experienced when coke was used to raise the carbon content, but this has now disappeared. When employing graphite ground down from electrodes to make certain of low carbon in the steel pour, the bottom of the furnace is thoroughly cleaned after each gray-iron pour. Excellent manufacturers' displays of all the latest foundry equipment were exhibited, including the standard makes of electric furnaces.

Expansion of Central-Station Service in Oklahoma



NO STATE in the Union, possibly, has shown more steady and rapid advance in the building and interconnection of high-tension central-station lines than Oklahoma. The above map, reproduced (with the omission of county names and most of the smaller cities and towns) from one issued by the Oklahoma Utilities Association, shows 2,367 miles of transmission. Of this, 2,160 miles is privately owned and connected to about twenty-five central power stations, 133 miles is municipally owned and connected to privately owned power plants, while 74 miles is owned by municipalities and connected to municipally owned and operated electric lighting plants. This forms a nucleus for a vast superpower system that is rapidly covering all sections of the state and will in time be connected to great interstate transmission systems.

A continuous line now reaches from Fort Smith, Ark., through Muskogee, Sapulpa, Cushing, Enid, Chickasha and Lawton to Quanah, Tex., while another trunk touching this line at El Reno connects Oklahoma City, Shawnee, Ada and Pauls Valley. Tulsa is the center of a network which serves thirty towns.

Big Plant for Louisiana

Natural Gas Will Generate 100,000 Hp. to Supplement Ouachita River Power in Three States

CONSTRUCTION of a 100,000-hp. electric power station in north Louisiana to generate electricity from natural gas and to be interconnected with the hydro-electric and steam plants of the Arkansas Light & Power Company in Arkansas and the power system of the Mississippi Power & Light Company in Mississippi is to be started immediately by the Louisiana Power & Light Company, according to information from the offices of H. C. Couch, president of the three companies. It is planned to have the big station completed within ten months. It is to be equipped with Westinghouse turbo-generators of 20,000 hp. capacity each. This steam-power station, which will when complete be the largest in that part of the United States, will be erected at Sterlington, La., on the Ouachita River, a few miles north of Monroe, where the company has contracted for enough natural gas to operate at full capacity for more than ten years.

In addition to supplying power for several large pulp and paper mills and other industries at Bastrop, Monroe and elsewhere, and for several cities and towns in Louisiana, 110,000-volt lines will tie the plant in with the Arkansas Light & Power Company's transmission system, probably at Pine Bluff or El Dorado, and with the Mississippi Power & Light Company's system at Vicksburg. The Mississippi River will be crossed by cables suspended from high steel towers. The lines will be constructed of Southern long-leaf yellow-pine creosoted poles and steel-cored aluminum cable. The poles will come from Louisiana and Mississippi, and the cable will be fabricated of aluminum derived from bauxite mined in Arkansas.

The power station is expected to cost about $7,500,000, or only about $75 per horsepower. Existence of gravel and other advantages of the site selected make for the utmost economy in construction. A large part of the power to be generated has, it is understood, been contracted for.

WATER-POWER DEVELOPMENT TO CONTINUE

Construction of the Sterlington power station will not retard in any way development of hydro-electric power on the Ouachita River, Mr. Couch says. In Arkansas it is being harnessed by the Arkansas Light & Power Company for the generation of 120,000 hp., and the first of three hydro-electric stations—Remmel Dam—is to be finished next month. After the water passes the wheels of the hydro-electric plants in Arkansas it is to be used for steam and condensing purposes at the Sterlington plant. This station will require about 33 tons of circulating water to every 1,000 cu.ft. of gas consumed.

The Louisiana Power & Light Company, undertaking this development, is allied with the Arkansas Light & Power Company and the Mississippi Power & Light Company, and has the same officials and directors.

Further development of the cotton-textile, paper-pulp and other industries is predicted as the result of this "superpower" system. Pine Bluff has already attracted one spinning and knitting mill and Bastrop a second large paper mill. Other towns in the cotton, cut-over pine land, clay and lumber sections are planning to conduct vigorous campaigns for new industries with abundant, cheap electrical power as their chief argument with manufacturers seeking sites.

Novel Plan for Increasing Use of Municipal Electricity

Word comes from Winnipeg, Manitoba, of a novel plan being tried there by the municipal Hydro-Electric System to increase the consumption of electrical energy. This plan consists of furnishing electric ranges without any expense to consumers, who, however, will have to pay for the energy consumed double the rate charged to those who have paid for their electric ranges in the ordinary way. The idea is to bring about the substitution of electric ranges for gas ranges, particularly in apartment houses. The city's funds are being used to purchase the electric stoves, the Hydro officials having apparently the power to do this, but the City Council, which was not a party to the venture, is agitated over it and will investigate the situation. At the increased rate charged it is said that it will take the city ten years to get its money back. The Winnipeg Electric Railway, which competes with the Hydro-Electric System in the supply of electricity for domestic consumption, also monopolizes the gas supply and has therefore no special interest in pushing the sale of electric ranges.

Citizens who see a possible tying up of a million dollars of the city's money in the purchase of these ranges, with no certainty that the double rate can be maintained and with the complications that will be caused by distinguishing between purchasers and free recipients of ranges, are not, it is asserted, viewing the Hydro's plan with special enthusiasm.

Regularization of Stream Flow Opposed

Unusual Suit Brought Against Southern California Edison by Stock Raisers Attracts Attention of the Federal Power Commission—Licenses and Permits Issued

THE injunction suit brought against the Southern California Edison Company by land owners in the San Joaquin Valley was discussed at a meeting of the Federal Power Commission on October 17. It was decided to call the matter to the attention of the Department of Justice, since the action would have a bearing on the development of the maximum water resources of streams. The land owners who seek the injunction contend that the plans of the Edison company for the construction of reservoirs on the eastern tributaries of the San Joaquin River will damage their lands because they will prevent the floods which, they claim, by inundating these lands periodically benefit them for grazing purposes. The case is unusual in that judicial intervention is sought to prevent the regularization of stream flow. Should the Attorney-General establish that the United States has equities in this case, it would have the effect of transferring the litigation to the United States courts.

LICENSES AND PERMITS

The commission at its meeting authorized the issuance of a license to the town of Petersburg in Alaska. The project covers the use of the waters of Crystal Lake in a development for municipal purposes. It is proposed to raise the level of the lake by 6 ft. A license in favor of the Nevada-California Power Company was authorized to permit it to enlarge its Rush Creek Meadows Reservoir by adding 10 ft. to the height of the present dam.

Preliminary permits were authorized in favor of the following: Walter Cravens of Kansas City for a 20,000-hp. project on the Osage River in Missouri involving the construction of a dam 100 ft. high, forming a reservoir with an area of 100 square miles; the Pringle Falls Electric Power & Water Company of Portland, Ore., for a 3,000-hp. development on the Deschutes River; Dell M. Potter of Clifton, Ariz. for a 15,000-hp. project on the Black River in Arizona, involving five diversion dams in Black River and in its east and west forks, from which water will be conveyed to four power houses.

DIXIE PERMIT EXTENDED

The preliminary permit covering a 9,000-hp. project of the Northwestern Power & Manufacturing Company on the Elwha River in Washington was extended. In compliance with a special act of Congress the preliminary permit of the Dixie Power Company was extended until October 15, 1925. It will be recalled that this permit was the basis of a controversy between Walker Powell of the Dixie Power Company and Hugh L. Cooper, who was considering the development of the project with the idea of transmitting the power to St. Louis. The permit of the Pacific Power & Light Company of Portland, Ore., covering a project near the mouth of the Deschutes River was extended until October 10, 1925.

The proposal of George W. Lucas to construct a power project at Ely's Ford, Va., on the Rapidan River, was found not to come under the commission's jurisdiction. The commission took jurisdiction, however, over a project of John W. Greer of Cordele, Ga., which involves the creation of a reservoir covering 2,500 acres on the Flint River near Warwick, Ga.

Secretary Work Accused

Chairman of Democratic Congressional Committee Calls Him Tool of "Power Interests"

THE chairman of the Democratic Congressional Campaign Committee, Representative Oldfield of Arkansas, has launched an attack on Secretary Work of the Interior Department, whom he accuses of being subservient to the "private power interests" alleged to be represented by Senator Phipps of Colorado. President Coolidge and Secretary Hoover are also assailed in Mr. Oldfield's attack as approving Mr. Work's course by their silence. The attack is based in part on the removal of A. P. Davis as director of the Reclamation Service and the more recent resignation of F. E. Weymouth, who succeeded Mr. Davis as chief engineer, though not as director. "The forced resignation of Weymouth," says Representative Oldfield, "admittedly one of the ablest engineers in the country, is merely another move in the policy of wrecking and discrediting the reclamation service for the benefit of the big power interests."

Mr. Work, replying to the attack, accuses Mr. Oldfield of ignorance of the Colorado River situation, on which he evidently relied to give color to his accusations, and points to President Coolidge's recommendation to Congress that the federal government build "a great dam at Boulder Canyon or some suitable locality obviously to be determined by the best engineering talent that can be secured in the nation."

In a rejoinder Representative Oldfield attacks the Federal Power Commission for its opposition to the Johnson-Swing bill to bring about government construction of the Boulder Canyon dam. He says:

"The milk in the cocoanut is the provision of the Johnson-Swing bill giving Los Angeles, other cities and the farming commissions of the Southwest priority in buying power wholesale from the proposed government dam project. I have no doubt whatever that the administration, particularly the Secretary of the Interior, would welcome the development of the power project at government expense, provided the private power companies were permitted to buy the juice at low, wholesale rates at the dam and resell it at fancy prices to the consumer."

A. E. C. Still for Department of Public Works

Return to the plan of government reorganization embodied in the Jones-Reavis bill, originally sponsored by the engineering profession and providing for a federal Department of Public Works, was decided upon at a meeting of the administrative board of the American Engineering Council at the headquarters of the Western Society of Engineers, Chicago, October 17. The board discussed the question of reclamation and adopted a resolution providing for a special committee to study the problem and formulate a policy. Appointment of engineer members to the Board of Tax Appeals, set up by Congress to hear complaints of taxpayers against the rulings of the Collector of Internal Revenue, was urged by the board. Only lawyers and certified accountants are now members of the Board of Tax Appeals, and only representatives of these two classes can practice before it. Engineering problems largely concern this body, it was said, and engineering membership is held essential.

The report of the coal storage committee, previously made public and now available in published form, was finally sanctioned. The board voted to invite the founder societies and other national bodies to co-operate in compiling an authoritative and comprehensive pamphlet on the compensation of engineers. A committee of from five to seven will be formed to direct the work. Action of the executive secretary in requesting engineering societies to consider the proposal to form a World Federation of Engineers was approved. This action was taken at the request of Doctor Sykers, president of the Engineers and Architects' Association of Czechoslovakia.

Members of the American Engineering Council were the guests of the Western Society of Engineers at a luncheon at the Auditorium Hotel on Friday. Former Governor James Hartness of Vermont, the president of the A. E. C., spoke on engineering co-operation, saying that unless engineers remember that the great achievements in their profession have been the result of co-operation of specialists they will overlook the great significance of the strides which have been made. Fred R. Low, president of the American Society of Mechanical Engineers, said that legislative bodies could cease to function for four years without creating a great disturbance, but cessation of the major industries for even a short time would paralyze the country. Engineers connected with these industries must devote their time to appraisal and development of the nation's resources. They must pursue the middle course between ill-regulated enthusiasm and self-satisfied conservatism.

Cost of Detroit Edison Plans $25,000,000 in Year

Plans of the Detroit Edison Company for the year from April, 1924, to April, 1925, involve a total expenditure of $24,745,900 for improvements and extensions. In that time the amount spent on the Trenton Channel development will have reached $8,396,000, two 120,000-volt outdoor substations will have been built in Detroit at a cost of $1,352,000, and line extensions costing $4,699,000 will have been made. Other items in the program now going on are $1,047,000 for improvements and additions to the Connors Creek power plant, $44,000 for the Delray plant, $156,000 for new generators and building additions to the Marysville plant, $293,000 for the French Landing hydro-electric plant, and $490,000 to provide additional power capacity for the Detroit United Railways.

Huron River Hydro Plants

Detroit Edison Company Is Building Its Sixth Water-Power Station on This Stream

ANOTHER hydro-electric generating station, to be operated under remote control and supervision, is being constructed on the Huron River at French Landing by the Detroit Edison Company to supplement the company's five other hydro-electric stations on the same river. While the station has a relatively small rating (3,100 kva. at 33-ft. head), it represents another step in the Detroit Edison's program to utilize in steps the stream flow adjacent to Detroit which is economically developable.

The dam will consist of an earth embankment about 750 ft. long, a spillway 180 ft. long, two sector gates each 33 ft. wide and the power house. Two Francis-type turbines and generators built by the Allis-Chalmers company, having capacities of 2,100 kva. and 1,000 kva. respectively at 33 ft., will be installed. This plant will be not only a generating station but also a distributing station for small towns in this section, which will be served at 4,600 volts. There will also be an outdoor substation which will connect the generating plant to the 23,000-volt system running through the vicinity of the station. This circuit will be equipped with service-restoring mechanism so that in case of trouble on any circuit the oil circuit breaker will close three times and, if the trouble is still on, the switch will remain open.

With the system of remote control and supervision the system operator will be able to tell at all times just what the elevation of water is above the plant, which machine is on the line, the gate opening at which it is operating, etc. The method of control will be as follows: The system operator will close the switch at Superior, 10 miles up the river, on the unit he wants to start up; this will energize the solenoid on the governor and the latter will open the turbine gates, permitting flow to the wheels. When the generator is in synchronism with the rest of the system, a special synchronizing device will cause the oil circuit breaker on the generator to close, putting the generator on the line. The governor will open the gates of the turbine to whatever gate opening it is set for. To shut the units down, the system operator will open the control switch at Superior. In case of any trouble within the generator or in the bearings the unit will be immediately taken automatically off the line and a signal sent in to Superior. There will be one gate on each side of the power house, and these will be used in time of high water to let down surplus water. They are of the sector type, their elevation being controlled by a motor-driven valve, although the gates are hydraulically operated.

Gardner S. Williams, consulting engineer, Ann Arbor, prepared the plans and specifications for the new plant, and the contract for the construction work was let to Phelps & Sons, Knoxville, Iowa, who started work early in July.

Briefer News

New Water-Power Plant for Iowa.—A dam site at West Mitchell, Iowa, on the Cedar River, has been sold to the Northeastern Iowa Power Company, which is starting a hydro-electric plant to furnish power to the surrounding towns. The dam will cost $250,000. It will be completed next July.

Medina (Ohio) Plant Changes Hands.—Control of the electric light and power plant at Medina, Ohio, has passed from the Union Gas & Electric Company of Cincinnati to the East Ohio Power & Light Company, a subsidiary of the Pennsylvania-Ohio Power & Light Company, with headquarters at Youngstown.

Progress of New Davenport Plant.—Electric locomotives energized from a third rail are being used in building the new United Light & Power Company plant on the Mississippi at Davenport, Iowa, which is making good progress and will eventually, it is said, cost $12,000,000. The cost is reported to be much lower than for steam locomotives.

For Patent Office Reform.—A committee headed by George A. Prevost of Washington and representing patent law associations and also the Chamber of Commerce of the United States has been formed with the object of simplifying methods of procedure and expediting the business of the Patent Office. It is to make a thorough review of the situation and submit suggestions to Secretary of the Interior Work.

North American Company Buys Skyscraper Office Building. — The North American Company, which controls operating light and power companies in many cities, has purchased the twenty-three-story office building at 60 Broadway, New York, in which it has rented three floors since 1921. The property is valued at more than $5,000,000 and has been acquired to give the North American Company a permanent home.

Wisconsin Executives and Commercial Men to Meet November 7.—Arrangements have been made for a one-day convention of Wisconsin utility executives and commercial men at the Hotel Loraine, Madison, November 7. In the morning there will be a discussion regarding the place of the commercial department in the public utility; in the afternoon a discussion will take place on how and why a utility should merchandise, and in the evening some well-known speaker will talk on a timely subject.

St. Maurice Power Plant Goes Into Service.—The St. Maurice Power Company, controlled by the Shawinigan Water & Power Company, has completed its hydro-electric development at La Gabelle on the St. Maurice River, in the Province of Quebec, and the plant is now producing 100,000 hp. The original plan did not call for completion before February 1, 1925. Four turbo-generator units have been installed, and there is space for a fifth.

Alhambra, Cal., to Have "White Way."—Alhambra, in southern California, is to become a "white way" city as soon as the state has recovered from the power shortage resulting from the unusually dry season. The installation of modern ornamental lighting units has been completed, and 1,000-cp. lamps will be used when the power supply is again normal. At present 600-cp. lamps are being used. Two lighting units are mounted on each post. The posts are spaced opposite each other along the curbs and are 120 ft. apart. General Electric units are employed.

Pennsylvania Railroad Electrification Projects.—In connection with the announcement of a new terminal station to be built at West Philadelphia for the Pennsylvania Railroad, which will rank with the finest in the country, Vice-president Atterbury of the railroad company said recently that the electrified portion of the road would be extended as far south as Wilmington, Del., and as far west as West Chester. "Ultimately," said Mr. Atterbury, "it is quite possible that we may electrify to New York."

British Post Office Installs an Automatic Underground Electric Railway.—The British post office authorities have placed a contract for electrification, equipment and rolling stock of the Post Office Tube between headquarters at Mount Pleasant, London, and the distribution centers and railroad stations in the West End of the city. A feature of the little railway which is to be used for the rapid conveyance of mails is that the trains will have neither driver nor guard, but will be operated under automatic electric control.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations is published in the first issue of each volume. See July 5 issue, page 50, for latest list.]

Illuminating Engineering Society, Briarcliff Manor, N. Y., Oct. 27-31. N. D. Macdonald, 29 West 39th St., New York.

American Welding Society — Hotel Winton, Cleveland, Oct. 30-31. M. M. Kelly, 29 West 39th St.

National Association of Railway and Utilities Commissioners — Phoenix, Ariz., Nov. 11-14. James B. Walker, New York Transit Commission, New York.

Associated Manufacturers of Electrical Supplies — Association office and Hotel Roosevelt, New York, Nov. 10-14. F. Nicholas, 30 East 42d St.

West Virginia Public Utilities Association—Charleston, W. Va., Nov. 14-15. Bliss McCrum, secretary.

National Electrical Credit Association (Middle and Atlantic States)—Philadelphia, Nov. 14. F. P. Rose, Marquette Bldg., Chicago.

Electrical Supply Jobbers' Association —Hotel Cleveland, Cleveland, Nov. 19-21. Franklin Overbagh, 411 South Clinton Street, Chicago.

American Society of Mechanical Engineers—New York, Dec. 1-4. C. W. Rice, 29 West 39th St., New York.

Western Association of Electrical Inspectors — Brown Hotel, Louisville, Ky., Jan. 27-29. G. M. Miller, 1304 South Seventh St., Louisville.

Albany Southern Railroad Company Now Eastern New York Utilities.—Consent of the New York Public Service Commission to the petition of the Albany Southern Railroad Company, whose headquarters are at Rensselaer, N. Y., for permission to change its name to the Eastern New York Utilities Corporation has been granted. The petition stated as the reason for change of name that the chief source of revenue of the company is from its electrical business and not from its railway operation.

Utilities Power & Light Corporation Buys Dubuque Company. — Announcement is made of the purchase of the Dubuque (Iowa) Electric Company from the Albert Emanuel Company of New York by the Utilities Power & Light Corporation of Chicago, which, through the Interstate Power Company, operates light and power plants in Iowa, Minnesota and Wisconsin, and which has interests also in other states. The change of ownership brings plans for immediately doubling the capacity of the Dubuque plant at a cost of considerably more than $1,000,000. Eventually a "superpower" station to serve interstate territory within a wide radius of the city is promised for Dubuque.

Shawinigan May Take Over Portneuf Plant.—Information from Quebec is to the effect that negotiations have been under way for the acquisition of the Portneuf Hydro-Electric Company by the Shawinigan Water & Power Company. This power plant has been under construction near St. Albans, Quebec, for the Compagnie Hydraulique de Portneuf. This company is developing 3,500 hp., which has been sold in advance to the North Shore Power Company, a subsidiary of the Shawinigan Water & Power Company. The development is capable of being enlarged to produce 6,500 hp. or even 13,000 hp. at certain seasons of the year.

National Radio Exposition to Coincide with Election Week.—The third National Radio Exposition is to be held in New York City in the Grand Central Palace in the week of November 3-8. This will be the presidential election week, and arrangements are in progress to make the exposition the last-minute forum of the campaign. Not only will facilities be placed at the disposal of the three chief candidates for the Presidency to broadcast from the Grand Central Palace closing messages to millions of listeners, but efforts will be made to broadcast election returns on a country-wide scale. The progress of radio will, as usual, be reflected in hundreds of exhibits.

Lincoln (Neb.) Companies Are Merged.—A merger of the competing electric light plants of the Lincoln (Neb.) Gas & Electric Company, a Continental Gas & Electric subsidiary, and

the Lincoln Traction Company, which operates also the street railway system of Lincoln, has been approved by the Nebraska State Railway Commission. The Continental has purchased stock control of the traction company and takes over all its property, including a steam-heating system in the business section of the city. The Lincoln merger is connected with the recently announced consolidation of large Mid-West utility companies, with their subsidiaries, known as the Continental-United Light & Power merger.

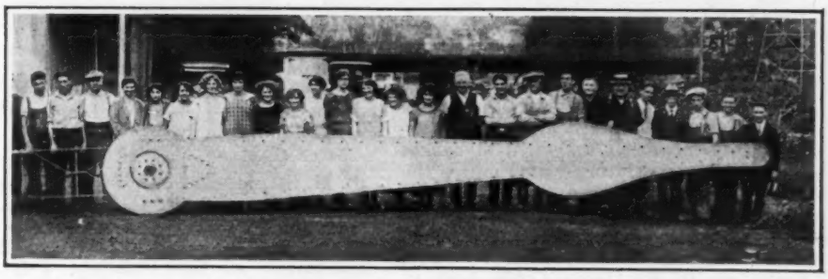
N. E. L. A. Advanced Accounting Course Completely Revised. — The National Electric Light Association's advanced course in electric utility accounting, consisting of thirty-six lessons, has just undergone a complete revision. It is now entirely up to date and is in conformity with the National Association of Railroad and Utilities Commissioners' uniform classification of accounts, which was approved by the N. E. L. A. convention last year. The course now contains the practices of the most progressive companies. The revision was carried out by a special committee headed by C. M. Breitinger of the Philadelphia Electric Company. Dr. J. T. Madden, assistant dean New York University School of Commerce, made a thorough review of the entire course.

Washita River Is Being Reharnessed at Chickasha, Okla.—The work of reharnessing the Washita River so that it will again serve the Chickasha Gas & Electric Company in the production of electricity at Chickasha, Okla., will be completed about December 15. A huge floodgate is being installed which the company hopes will take care of any flood emergency. The Chickasha hydro-electric power plant will be the largest in Oklahoma and will furnish electricity for several cities and towns in Grady and Caddo Counties. The plant was left high and dry about a year ago when floods of the Washita River carried out the company's dam and changed the course of the stream. Since that time the company has had a supplemental supply of electricity from the high-tension lines of the Oklahoma Gas & Electric Company's station at El Reno.

Wisconsin Association Inaugurates Public Relations Section.—The Wisconsin Utilities Association has recently inaugurated a public relations section, which will probably have charge of one of the general sessions of future conventions. The existing women's public information committee will be made a committee of the newly formed section, and there will also be committees on co-operation with educational institutions, customer ownership, industrial relations and public speaking, the last named to function in conjunction with the speakers' bureau. President Neff has appointed as chairman of the new section John St. John, vice-president and general manager Madison Gas & Electric Company, and as vice chairman George H. Wilmarth, division manager of the Northern States Power Company, Eau Claire.

More Electrification Contemplated in Texas.—Following the recent opening of the electrified line of the Missouri, Kansas & Texas Railway between Dallas and Denton, 37 miles, and its operation by the Texas Interurban Railway Company, the latter is negotiating with the Gulf, Colorado & Santa Fé for the electrification of its division between Dallas and Cleburne and its operation as an interurban line. The distance is 53 miles. An extension of the Denton line to Gainesville and thence to Wichita Falls, 177 miles, and extension of the Dallas-Terrell line of the Texas Interurban Railway Company east to Tyler are being agitated, but nothing definite has yet been done.

World's Greatest Clock Runs by Electricity.—The largest clock in the world —so its owners confidently assert—will henceforth give the time to thousands of travelers on Hudson River where it empties into New York Bay. This is the new clock of Colgate & Company, which takes the place of one that for many years has called attention to their Jersey City factory. The new clock, wound by a ¼-hp. General Electric motor, rated at 110 volts, 25 cycles, single-phase, has a diameter across the dial of 50 ft. The minute hand is 38 ft. 3 in. long and the hour hand 27 ft. 6 in., the hands weighing together 3,925 lb. More than two hundred lamps placed at regular distances around the hands make it as easy to tell the time by night as by day. The old clock, 12½ ft. less in diameter than the new one, has been shipped to Colgate's factory at Jeffersonville, Ind., famous as a Civil War prison.



New Cable to Link America and Germany.—Clarence Mackay, president of the Commercial Cable Company, announces arrangements with Dr. George Solmssen, president of the board of the German Atlantic Telegraph Company, for the laying of a cable between Germany and the United States. The cable from New York to the Azores will belong to the Commercial Cable Company, and the cable from the Azores to Germany will belong to the German company, but they will be connected at the Azores automatically. The cable will be of the latest design, capable of the highest speed.

Hetch Hetchy Water Bonds Carried by Twenty to One.—The special election held in San Francisco on October 7 to vote on an issue of $10,000,000 in water bonds resulted in an overwhelming indorsement of the proposal, the vote standing 68,513 to 3,354. While this money will be used only on the water-supply features of the Hetch Hetchy project, it is hailed by the champions of municipal power development as indicating clearly that the citizens will see the joint water and power plans through.

Northern States Paper Mills Company to Build 75-Mile High-Tension Line in Wisconsin. — The Northern States Paper Mills Company (not the Northern States Power Company, as erroneously reported) has in contemplation the erection of a 66,000-volt transmission line from White Rapids, on the Menominee River, near Amberg, to Green Bay, Wis., a distance of 75 miles. It will be a steel-tower one-circuit line, with provision for the addition of a second circuit.

Water-Power Tax Again Discussed in Ontario.—The officials of the Department of Lands and Forests of Ontario are again discussing a proposal to impose a general tax on all water powers in the province, regardless of the auspices under which they are being developed. A bill brought into the Provincial Legislature last year on first reading contained clauses proposing a new tax levy on water powers, machinery and other properties in connection with mines, pulp mills and other industries. It was later claimed that a mistake had been made in drafting the measure, and the bill was withdrawn. Present proposals are said to involve a general tax upon all power developed at a fixed rate per horsepower, this to be in addition to the water rentals levied in the leases from the crown for the use of water, where such rentals are charged, which is not in all cases. The tax would apply to public undertakings as well as private developments.

Miniature Electrified Farm Draws Crowds at Puyallup, Wash.—Declared to be the most comprehensive exhibit of electrical appliances and of the uses of electricity on the farm and in urban homes ever made in the Pacific Northwest, the Puget Sound Power & Light Company's exhibit at the recent Western Washington Fair at Puyallup, Wash., attracted such crowds that the visitors had to be handled in squads. The exhibit included a completely designed farm in miniature. Adjoining the cottage was a blacksmith and repair shop, completely electrified. Then came the chicken house, with the hatchers and brooders electrically heated. An electrically operated irrigation plant showed the newest methods of irrigating by electricity. A silo was filled by an electric cutting machine. There were also a complete water sys-

tem and a modern dairy, equipped with electric separators and automatic milkers.

A Pan-American Standardization Conference. — Lima, Peru, has been selected as the meeting place in December next of the first Pan-American Standardization Conference. This conference, called with the co-operation of all the American republics will determine upon uniform specifications and quantity nomenclature for raw materials, merchandise and commercial equipment. The sessions also will take up the general subject of standardization—its principles and its importance in the economic development of the world, with particular reference to inter-American trade. Accomplishments of European countries in establishing uniform standards will be reviewed. Advocates of the metric system are looking to the conference to strengthen the movement for the adoption of that system in the United States. It prevails in all the other countries which are to be represented.

Carrying Fish Over Dams.—At a recent conference in Seattle between United States engineers, federal fisheries representatives, state fisheries heads and power representatives Prof. J. N. Cobb, director of the College of Fisheries, University of Washington, asserted that success in getting mature salmon up high dams which bar their way to the spawning field had been attained by means of a system of basket elevators or escalators which entice the fish into pools on the upper side of the low waterfalls, from which they are scooped up by dry baskets and dumped over the dam without injury. Thus, according to Professor Cobb, half of the problem that stands in the way of high power dams in the Columbia River and elsewhere has been solved. The half not yet solved is how to get the small salmon down over the dam after they are hatched and start for the sea, where they mature.

Red Cross Work Among Electrical Companies.—Frank W. Smith, vice-president of the United Electric Light & Power Company, heads as volunteer "roll-call chairman" a special public utilities (electric, gas and traction) group to enlist the maximum response among the public utilities employees of New York City to the annual Red Cross appeal for funds to maintain the organization's relief work and public health program. The work begins on November 11, Armistice Day. Mr. Smith served as chairman of a similar group in last year's "roll call." Charles L. Eidlitz heads as chairman the electrical contractors' group, and G. E. Cullinan, general sales manager of the Western Electric Company, is chairman of the electrical machinery and supplies group. Special committees of other outstanding figures in the field will cooperate with these volunteer chairmen in the roll-call effort to enlist new memberships in the Red Cross Society and plans for comprehensive activity throughout all the groups that make up the electrical industry are in operation and promise excellent results.

Men of the Industry

Goulding W. Swift, formerly associated with the treasurer's department of Stone & Webster, Inc., Boston, has been transferred to that organization's property at Lake Charles, La., in the capacity of assistant treasurer.

Robert Miller, manager of the General Electric Company's Salt Lake City sales office, has been appointed acting manager of the Rocky Mountain district in the absence of H. D. Randall through ill health.

E. A. Carnes, local manager of the Consolidated Light & Power Company at Sheffield, Ill., has been transferred to the head offices of the company at Kewanee, Ill. The Consolidated Light & Power is controlled by the American Gas Company.

E. A. Irons, who has been identified with the Westinghouse Lamp Company for several years, has been appointed branch manager of the company in Seattle to succeed R. F. Buckles, recently transferred to the San Francisco office.

Ludwig Reichold, formerly connected with the General Electric Company at Pittsfield, Mass., has terminated his association with that organization to become electrical engineer for the Fitzgerald Manufacturing Company at Winsted, Conn.

P. M. Staehle has been appointed general assistant to H. F. McRell, sales manager of the distribution transformer section of the central-station department at the Pittsfield (Mass.) works of the General Electric Company. Previously he was in charge of estimating and sales correspondence at the company's Fort Wayne factory.

H. A. Walsh, who formerly was assistant chief engineer of the Ponce (P. R.) Electric Company, has been assigned to new duties in the Port Arthur station of the Eastern Texas Electric Company. Both these utilities are under the management of Stone & Webster.

Elliott S. Belden has been appointed head of the department of public relations of the United Power & Light Corporation, Abilene, Kan. Previous to joining the United company Mr. Belden was secretary of a Topeka publishing company, having been identified with the newspaper and publishing fields since his graduation from Washburn College.

Ray L. Stout has been appointed assistant engineer of the Pacific Power & Light Company, Portland, Ore., as a result of the retirement from active service of William H. Galvani, announced in last week's issue of the ELECTRICAL WORLD. Previous to his connection with the Portland utility in 1910, Mr. Stout had engaged in land-survey work for the government and in construction work with W. S. Barstow & Company for the Oregon Electric Railway Company and in the construction of the underground electric distribution system of the Portland Electric Power Company in Portland. He is a native of Oregon and a graduate of the Oregon Agricultural College.

R. F. Walter, assistant chief engineer of the Bureau of Reclamation, has been designated as acting chief engineer to fill the vacancy caused by the resignation of F. E. Weymouth, which was announced in a recent number of the ELECTRICAL WORLD. Mr. Walter will begin the performance of his new duties on November 1, with headquarters in the Denver office of the bureau.

L. R. Sheeley, who has been associated with the Pacific Power & Light Company since 1910, has severed his connection with that organization to become superintendent of the Bend Water, Light & Power Company at Bend, Ore. During his fourteen years of service with the Pacific Power & Light Mr. Sheeley was connected with the Yakima, Sunnyside and Pendleton districts.

Earl B. Ball, formerly new-business manager of the western division of the Public Service Company of Colorado with headquarters in Boulder, is now connected with the recently organized new-business department of the company with headquarters at Denver. Mr. Ball was connected with the new-business department of the Western Light & Power Company for a number of years.

Charles B. Scott, general manager of the Bureau of Safety, Chicago, has been elected vice-president and treasurer of the National Safety Council. Among the newly elected officers for the Public Utilities Section are **George Opp** of the Detroit Edison Company, elected vice-chairman, and **C. J. Rutland** of the Texas Power & Light Company, elected secretary.

T. T. Parker, vice-president and general manager of the Dubuque (Iowa) Electric Company, which was recently purchased by the Utilities Power & Light Corporation, will soon leave Dubuque to assume other responsibilities with the Albert Emanuel Company, Inc., the former owner of the Dubuque property. Mr. Parker has been manager of the Dubuque Electric Company for about two years, going there from Kansas to succeed O. H. Simonds. He will remain in charge until the new owners are ready to have him turn the property over to his successor, who has not yet been named.

G. Grenville Hunter, formerly publicity director of the International General Electric Company, will join the staff of Thomas F. Logan, Inc., New York. Mr. Hunter entered the service of the General Electric Company early in 1919 and was successively employed in studying the company's systems of accounting, production and advertising. A year later he was transferred to the merchandising staff of the International General Electric Company and was

soon made publicity director in charge of all overseas sales promotion. Perhaps Mr. Hunter's greatest contribution to the electrical industry has been a world-wide survey of merchandising conditions to determine the relative merits of local channels of distribution, with a study of centralized control of export advertising and the economics of producing sales-promotion material for various export markets. In joining Mr. Logan's staff Mr. Hunter will still be identified with General Electric interests and with those of the industry in a broader way.

Glenn B. Tucker, for some time connected with the Watertown (N. Y.) office of the Northern New York Utilities, Inc., has been appointed general manager of the company's offices and plant at Rome, N. Y., effective Nov. 1. The Northern New York Utilities recently acquired the Rome Gas & Electric Company.

B. N. Broido, who has been doing special consulting work for the Superheater Company of New York and Chicago, has recently been appointed chief engineer of the industrial department of the company.

F. F. McCammon, who for a number of years has had charge of the power sales work in the new-business department of the old Denver Gas & Electric Light Company, has been appointed manager of the power sales division in the newly organized new-business department of the Public Service Company of Colorado.

G. F. Hain, formerly with the Portland office of the Westinghouse Electric & Manufacturing Company, was transferred to the Spokane office as special representative in charge of electrical merchandising. Mr. Hain replaces C. H. Rice, resigned.

C. B. Hann of the sales engineering staff of the New York office of the Bristol Company, Waterbury, Conn., has been transferred to the Boston office of the company in the same capacity.

R. A. Mitchell, vice-president of the Alabama Power Company, has been elected president of the Anniston Electric Steel Corporation, succeeding W. S. Hotchkiss, resigned. Mr. Mitchell will direct the executive department of the steel company from his present headquarters in Birmingham.

William O'Connor, for several years manager of the lamp department of the General Electric Company, Buffalo, has severed his connection with that organization to become associated with his two brothers in an insurance business at Hornell, N. Y.

Charles F. Clark, who has been superintendent of the transportation department of the Commonwealth Edison Company, has been appointed chairman of the company's recently organized transportation committee. The change in administration was necessitated by the rapid growth of the transportation department. Mr. Clark will devote his time principally to keeping in close touch with departments using a large volume of transportation for the purpose of improving the service and effecting economy.

George A. Iler Heads Operating Department in Youngstown

George A. Iler, electrical engineer with the Pennsylvania-Ohio Power & Light Company, Youngstown, has been appointed head of the operating department, according to an announcement made by Vice-president and General Manager MacCalla. Mr. Iler has jurisdiction over all electrical matters regarding operation, including metering, construction and engineering. He has a background of wide experience in electrical work, having engaged in the construction and operation of power generating plants and transmission systems and in general electrical engineering in various parts of the country. In addition to this practical experience he rounded out his education by a post-graduate course at the Georgia Institute of Technology. Among the important work in which he has been employed are included the building and operating of the first power-transmission lines for the General Electric Company in the New River coal district in West Virginia, the early application of electrical power to mining projects there and the construction of the Georgia Railway & Power Company's 100,000-hp. hydro-electric power plant.

G. A. ILER

A pioneer in the development of radio engineering, Mr. Iler was for several years connected as radio engineer with the Westinghouse Electric & Manufacturing Company and for the year previous to his affiliation with the Pennsylvania-Ohio company he was radio engineer for the Atlanta *Journal*, constructing and operating the big broadcasting plant of that paper.

R. E. Baird, manager of the properties of the Oklahoma Gas & Electric Company in Pauls Valley, has resigned to devote his time to private business enterprises in Florida. Mr. Baird has been manager at Pauls Valley for the past year and was previously identified with the company's Poteau office in the same capacity.

Carl B. Auel, manager of the employees' service department of the Westinghouse Electric & Manufacturing Company, has been elected president of the National Safety Council to succeed Lewis A. DeBlois. Mr. Auel was previously vice-president in charge of general activities and has for years been actively identified with the accident prevention work of his own company and with the safety movement in general.

W. J. Graham, formerly commercial manager of the Dubuque Electric Company, has been appointed commercial manager of the Keller Electric Company.

E. M. Bassler, Jr., for the past twelve years purchasing agent with the Bayley Manufacturing Company, Milwaukee, has resigned to become identified with the Electrical Machinery Company, Milwaukee.

Donald McDonald, Jr., of B. F. Avery & Sons, implement manufacturers, Louisville, was named a director of the Louisville Gas & Electric Company to fill the vacancy caused by the recent death of his father, who was also vice-president and general manager of the company.

A. T. Smith, electrical engineer for the Fitzgerald Manufacturing Company, Winsted, Conn., has retired to organize a new manufacturing company.

W. C. McWhinney has been made general business agent of the Southern California Edison Company. Mr. McWhinney has been associated with the Edison company since the Pacific Light & Power Company, of which he was an employee, was merged with that organization. During his period of service with the Edison company he has been district manager, assistant superintendent of sales and commercial statistician.

Obituary

Harry Wallace Link, purchasing agent of the Crouse-Hinds Company, Syracuse, N. Y., died of typhoid pneumonia on October 18 at the Syracuse General Hospital. He had been ill six weeks. Mr. Link had a wide acquaintance among electrical men in Syracuse and had been identified with the Crouse-Hinds Company since the early days of its organization. He was forty-seven years of age.

Patrick Bernard Delany, inventor and for fifty years an associate of Thomas A. Edison, died on October 19 at his home in South Orange, N. J., as the result of a heart attack. A native of Ireland, Mr. Delany came to America at an early age and learned telegraphy in Hartford, Conn., subsequently engaging in newspaper work. His greatest achievements were in the field of telegraphic invention, and he had to his credit 150 successful patents, the result of his untiring efforts in the laboratories he maintained in Nantucket, Mass., and South Orange. Mr. Delany was the recipient of the Elliott Cresson gold medal twice and of the John Scott legacy medal of the Franklin Institute, of which he was a member. He was also a member and a former vice-president (1893-95) of the American Institute of Electrical Engineers. Mr. Delany was eighty years of age.

Financial and Corporate

Utility Prices Recover

Downward Trend Is Checked by Small Rallies Throughout List During Week

THE market movement for power and light stocks both in the listed and unlisted groups has conformed to that for stocks of other descriptions to a greater extent in recent weeks than was the case earlier in the year. A week ago a record was made in this column of sharp losses throughout the utility list. That was when the markets generally were declining. The downward trend was checked during the past week in the utility market, however, and the whole securities market has settled down to a somewhat steadier tone. Perhaps it is no more than natural that traders and investors should allow political events to take more definite shape before either extending or contracting their line of holdings.

At any rate during a week which showed a mixture of relatively small losses and gains the gains predominated, and, curiously enough, the greater gains came in utility stocks which the week before had suffered most. A week ago, it will be remembered, the more severe declines came in such issues as American Water Works & Electric common, Middle West Utilities, American Power & Light and National Power & Light. These were the issues that made the best showing in the recovery.

Southern California Edison to Maintain Regular Dividend

In spite of the refusal of the Railroad Commission of California to grant an increase in rates to the Southern California Edison Company, there is no reason for the belief that the dividend on the common stock may be cut. In commenting on the decision of the commission, the details of which were published in last week's issue of the ELECTRICAL WORLD, John B. Miller, president of the company, said: "There is no justification for any question whatsoever as to the ability of the Southern California Edison Company to maintain its regular dividend on the common stock at the rate of 8 per cent annually, which is now in effect and is to continue."

New Offerings Meager

During the seven-day period ended October 22 only two new issues of electric light and power securities were offered investors—one in the form of preferred stock and the other refunding mortgage bonds. The Middle West Utilities Company floated an additional issue of 7 per cent prior-lien stock to the amount of 20,000 shares at $98 per share and accrued dividends to yield about 7.14 per cent. It is worthy of note that the prior-lien stock is entitled to an additional 1 per cent dividend in any calendar year in which the total cash dividends paid on the common stock exceed $5 per share. The proceeds of this issue, which has been oversubscribed according to an announcement made by the syndicate which underwrote it, are to be used in the acquisition of new properties and for other general corporate purposes. The Calumet Gas & Electric Company, of recent fame as the purchaser of fourteen other utilities in Indiana, was the other participant in the week's activities, contributing $2,500,000 in first and refunding mortgage 6 per cent gold bonds. The price of these bonds was 97 and interest, yielding over 6.20 per cent.

American Water Works Stockholders to Vote on Split-Up

The directors of the American Water Works & Electric Company have called a special meeting of stockholders to vote on changing the par value of the common shares from $100 to $20, exchanging five new shares for each share outstanding. The meeting will be held on November 21. It is proposed to increase the authorized common capital stock from $10,000,000 now authorized and outstanding to $50,000,000. The New York Curb Market has admitted to trading the new twenty-dollar par value stock on a "when issued" basis.

Niagara Falls Power Company's Set-Up

A Utility Company that Ranks Among the World's Most Interesting Hydro-Electric Developments —Financial Changes in 1924

BY PAUL WILLARD GARRETT

THE old Niagara Falls Power Company was incorporated back in 1886, but the Niagara Falls Power Company that we know today and which represents a consolidation of three companies was not formed until 1918. In the early fall of that year the old Niagara Falls Power Company, the Hydraulic Power Company of Niagara Falls and the Cliff Electrical Distributing Company were consolidated as part of the government's plan to provide better service to the industries of the Niagara Falls section.

The company's growth subsequent to

THE GROWTH OF THE NIAGARA FALLS POWER COMPANY HAS PLACED ITS SECURITIES ON A HIGH PLANE

the consolidation has drawn investors' attention afresh to Niagara Falls Power securities, but the unique position of the company as a hydro-electric development long had given it prominence.

On April 18, 1924, the stockholders of the Niagara Falls Power Company approved a plan whereby changes were made in the par value of the capital stock. For that reason the March 31, 1924, figures are used in this paragraph to indicate the proportion of the company's capital that is borrowed and the proportion that is contributed. On that date the Niagara Falls Power Company was capitalized at $71,588,300. Funded debt represented $37,568,500 and capital stock the remaining $34,019,800. That is approximately half bonds and half stock, and a further division on the same basis shows the stock to be about half preferred and half common. The proportions give an even balance to the capital structure and add to the attractiveness of Niagara Falls Power securities with conservative investors. That the $37,568,500 in bonds are pretty well protected from the standpoint of assets is indicated by the fact that the plant and real estate alone are valued at $71,070,869.

THE 1924 FINANCIAL CHANGES

In April, 1924, as had been said, some changes were made in the character of the capital shares. The changes were not essentially different from those made this year by numerous other power and light companies. In brief, the stockholders approved a change in the preferred stock whereby the 200,000 shares of $100 par value were turned into 800,000 shares of $25 par value. At the same time the common stock formerly outstanding to the amount likewise of 200,000 shares of $100 par value was changed to 800,000 shares of no par value. The newly created preferred and common stock both are listed on the New York Stock Exchange.

Niagara Falls Power Company bonds commonly are recognized to be among the premier examples of hydro-electric obligations and, indeed, of power and

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par value of stocks is $100.)

Companies	Bid Price Saturday, Oct. 18	Low 1924	High 1924
PREFERRED STOCKS			
Operating Companies			
Adirondack Power & Light 7 per cent	97	94	97¾
Appalachian Power, 7 per cent	90	85½	90
Arkansas Light & Power 7 per cent	90	81	93
Asheville Power & Light 7 per cent	96	96	99
Carolina Power & Light 7 per cent	98	95½	101
Central Illinois Public Service 6 per cent	84	84	87
Colorado Power 7 per cent	92	90	97
Connecticut Light & Power 7 per cent	103	99	106
Consumers' Power 6 per cent	90	85	93
Dayton Power & Light 6 per cent	84	84	90
Duquesne Light 7 per cent	106	103½	107¾
Eastern Texas Electric 6 per cent	100	81	100
Empire District Electric 6 per cent	73	70	78
Fort Worth Power & Light 7 per cent	99	97	102
Great Western Power 7 per cent	98	96	99
Illinois Northern Utilities 6 per cent	82	82	87
Illinois Power & Light 7 per cent	92	84	95
Kansas Gas & Electric 7 per cent	93	92	97
Long Island Lighting 7 per cent	97	95	98½
Minnesota Power & Light 6 per cent	89	78	89
Mississippi River Power 6 per cent	87	80	90
Nebraska Power 7 per cent	96	89	99
Niagara Falls Power 7 per cent—25	27½	26	29
Niagara, Lockport & Ont. Power 7 per cent	101½	99½	104½
Northern States Power 7 per cent	94	91	97
Ohio Public Service 7 per cent	94	86	100
Pacific Gas & Electric 6 per cent	90	85½	92½
Penn-Ohio Power & Light 7 per cent	91	84	96½
Pennsylvania Power & Light $7—no par	99	93	99
Penn. Public Service 7 per cent	90	90	100
‡Philadelphia Electric 8 per cent—25	a 37½	29½	39¾
Southern California Edison 8 per cent	116	112	120
Tennessee Electric Power, 6 per cent	78	71	81
Texas Power & Light 7 per cent	97	95	97
Utah Power & Light 7 per cent	95½	94	96½
Western States Gas & Electric 7 per cent	80	78	85
Yadkin River Power, 7 per cent	97	94	97½
Holding Companies			
American Gas & Electric 6 per cent—50	43½	41½	46
American Light & Traction	92	91	94½
American Power & Light 6 per cent	89½	84	91
American Public Service 7 per cent	88	84	92
American Public Utilities 7 per cent	90	73	90
American Water Works & Electric 6 per cent	a 90	66	99
Carolina Power & Light 7 per cent	98½	95½	99½
Central Indiana Power 7 per cent	89	80	92
Cities Service 6 per cent	76½	67	77
Commonwealth Power	a 75½	72	82
Consolidated Gas 6 per cent—50	57	51	59½
Continental Gas & Electric 7 per cent	88	69	93
Electric Bond & Share 6 per cent	100	96½	103
General Gas & Electric—$8—no par	102	96	103½
Middle West Utilities 7 per cent	91	80	91
National Power & Light—$7—no par	92½	84	96½
North American 6 per cent—50	a 47½	43¼	50½
Northern Ohio Electric	a 22	16	34
Public Service Corp. of N. J. 7 per cent	99½	96½	100½
Public Service Corp. of N. J. 8 per cent	107½	99½	110
Standard Gas & Electric 8 per cent—50	48½	46½	49½
‡United Gas Improvement—50	56½	55½	58
United Light & Power—$6.50—no par	83	75¾	84
COMMON STOCKS			
Operating Companies			
Adirondack Power & Light—50	31½	22½	34
Appalachian Power—no par	69	66	93
Arkansas Light & Power	60	22	63
Brooklyn Edison	a 117	107½	120
Buffalo General Electric	149	118	155
Carolina Power & Light	220	82½	245
Colorado Power	33	21	35
Commonwealth Edison	132	126	135
§Consolidated Gas, Electric Light & Power	a 135	108	148½
Dayton Power & Light	160	70	160
Detroit Edison	a 109	102½	110½
|| Edison Electric Illuminating of Boston	a 178	163½	190
*Kentucky Hydro-Electric	87½	84	87½
Long Island Lighting	160	100	195
Mississippi River Power	32	18½	34
Montana Power	a 65	61½	71
Niagara Falls Power—no par	42	42	48
Niagara, Lockport & Ontario Power—no par	51	45	59
Northern Ohio Electric—no par	7	5	16
Northern States Power	101	92	106
North Texas Electric	58	58	84
Pacific Gas & Electric	a 95	90½	99¾
‡Penn Central Light & Power—no par	59½	57	60
Pennsylvania Water & Power	107	98½	110½
‡Philadelphia Electric—25	a 37½	29	39¾
Public Service Co. of Northern Illinois	97	97	104
Puget Sound Power & Light	50	43½	61½
Southern California Edison	99	95	106
Tampa Electric	a163	134	163
Tennessee Electric Power—no par	36	20	43
Virginia Power	55	16	70
Virginia Railway & Power	a 60½	36	72¾
West Penn. Co.	88	47½	98

Companies	Bid Price Saturday, Oct. 18	Low 1924	High 1924
Holding Companies			
‡American Electric Power—50	62	22½	62½
American Gas & Electric—no par	83½	43½	97
American Light & Traction	136	115	148
American Power & Light	42½	34½	48½
American Public Utilities	88	35	97
American Water Works & Electric	a114	40	126½
Carolina Power & Light—no par	224	103	240
Cities Service	140	140	155
Columbia Gas & Electric—no par	a 43½	33	44½
Commonwealth Power Corp.—no par	98½	56	109
Consolidated Gas—no par	a 70¾	60¾	75½
Continental Gas & Electric	84	49	96
Federal Light and Traction	a 86½	75	86½
General Gas & Electric	55	22	63
Lehigh Power Securities—no par	79	31	89
Middle West Utilities—no par	70	41	86
National Power & Light—no par	160	60	190
Philadelphia Co.—50	a 48	42½	53½
Power Securities—no par	8	4	14
Public Service Corp. of N. J.—no par	a 60¾	39	63
Standard Gas & Electric—no par	a 38½	31½	40½
United Gas & Electric (Conn.)—no par	27	14	42
Utah Securities	a 32	16½	37
BONDS			
Operating Companies			
Adirondack Power & Light	6s 1950	102½	97½ 103
Alabama Power	5s 1946	95½	90¾ 96½
Appalachian Power	5s 1941	95½	89 95½
Brooklyn Edison	5s 1949	a101	97½ 102½
	6s 1930	a105	102½ 106½
	7s 1940	a108	107 110½
Cleveland Electric Illuminating	5s 1939	100½	98½ 101
Commonwealth Edison	5s 1943	99½	95 100
	5s 1953	98½	92 99½
§Consol. Gas, Elec. Lt. & Pwr.	4½s 1935	a 92	91 95½
	6s 1949	a105	101½ 105
Consumers' Power	5s 1936	98½	94½ 99½
	5s 1952	90	87 92½
Detroit Edison	5s 1933	a101½	99 101½
Duquesne Light	6s 1949	a105½	103½ 106½
Great Western Power	5s 1946	95	90½ 96
Kansas City Power & Light	5s 1952	a 94½	89 95½
Mississippi River Power	5s 1951	96½	92 97
Montana Power	5s 1943	a 98½	95 98½
New England Power	5s 1951	99	97 100
New York Edison	6½s 1941	a112½	109½ 112½
Niagara Falls Power	6s 1950	105½	104 105½
Northern States Power	5s 1941	a 94	89½ 94½
	6s 1941	101½	101 104½
Ohio Power	7s 1951	106	103 106½
Pacific Gas & Electric	5s 1942	a 95	90½ 95
Pennsylvania Water & Power	5s 1940	99	96 99½
‡Philadelphia Electric	5s 1966	100¾	97 103½
	5½s 1947	a 104	99½ 104
	6s 1941	a 107	103½ 107½
Portland Electric Power	6s 1947	a 94½	89½ 97
Southern California Edison	5s 1939	99½	96 100
	6s 1944	102½	100 103½
Tennessee Electric Power	6s 1947	a 98	93½ 98½
Texas Power & Light	5s 1937	96½	91½ 96½
Toledo Edison	7s 1941	a 109½	106 109½
Utah Power & Light	5s 1944	a 92½	87½ 93½
Holding Companies			
Alabama Traction, Light & Power	5s 1962	80	65½ 83
American Gas & Electric	6s 2014	95½	94 95½
American Power & Light	6s 2016	94½	91 94½
Amer. Water Works & Electric	5s 1934	a 92½	84½ 94
Central Indiana Power	6s 1947	94½	88 95
Commonwealth Power	6s 1947	97½	87 98
Consolidated Cities Lt., Pwr. & Tr.	5s 1962	75½	64 76
Illinois Power & Light	6s 1953	99	95 100½
United Light & Railways	5s 1932	93¾	87½ 94
	6s 1952	96	92 97½
ELECTRICAL MANUFACTURING COMPANIES			
PREFERRED STOCKS			
Allis-Chalmers Manufacturing		99	90 100½
*National Carbon		118½	112 125
Worthington Pump & Machinery	(A) a 81		68 85
COMMON STOCKS			
Allis-Chalmers Manufacturing	a 57½		41½ 66½
American Bosch Magneto—no par	a 24½		22½ 38¾
Electric Storage Battery—no par	a 57½		50½ 64
General Electric	a 249½		193½ 281
General Electric—10	a 10½		10½ 11½
*Hurley Machine—no par	60		48 65½
†Wagner Electric	23		20 34½
Westinghouse Electric & Manufacturing—50	a 61½		55½ 65
Worthington Pump & Machinery	a 43		23½ 47½
BONDS			
Canada General Electric	6s 1942	106¾	102¾ 107
General Electric	3½s 1942	a 83	80 83¾
	5s 1952	104¾	100 105
Robbins & Myers	7s 1952	a 74½	75 91½
†Wagner Electric Manufacturing	7s	a101	97 101
Western Electric	5s 1944	a 98½	96 99
Westinghouse Electric & Mfg.	7s 1931	a108½	106½ 109½

*Chicago Stock Exchange. †St. Louis Stock Exchange. ‡Philadelphia Stock Exchange. || Boston Stock Exchange. § Baltimore Stock Exchange.
a Bid price Wednesday, October 22.

light obligations generally. Interest charges have been earned something like two and a half times annually for a period of years. The even flow of the stream by the aid of which the company generates power, the richness of the territory served and the extra revenues derived through its real estate holdings combine to place the bonds on a high investment plane.

Company Reports

Among the company reports issued during the past week for the month of September are the following:

Name of Company	Gross Revenues for September 1924	1923
Adirondack Power & Light....	$627,386	$564,198
Appalachian Power.....	322,943	305,131
Brazilian Trac., Lt. & Power*	2,217,189	2,080,831
Central Power & Light*.....	425,765	354,603
Columbia Gas & Electric.....	1,713,732	1,511,010
Detroit Edison.....	2,461,301	2,281,990
East Penn Electric.....	249,311	215,286
Kansas City Power & Light...	720,188	663,727
Manila Electric.....	309,730	305,075
Niagara, Lockport & Ont. Pr.	489,556	462,095
Southern Utilities.....	234,304	193,797
Southwestern Power & Light*	941,767	860,933
Utah Securities.....	922,419	845,942

* August

Dividends Declared

The following quarterly dividends were announced by central-station companies and electrical manufacturing companies during the seven-day period ended October 21:

Name of Company	Per Cent	When Payable
American Superpower, A & B*.....	60c	Nov. 15
American Water Wks. & El., 1st pf.	1¾	Nov. 15
American Wtr Wks & El., partic. pf	1¼	Nov. 15
Brazilian Trac., Lt. & Pr, ordinary	1	Dec. 1
Columbia Gas & Electric, com.....	65c	Nov. 15
Columbia Gas & Electric, pf.....	$1.75	Nov. 15
Connecticut Ry. & Ltg., com & pf.	1¾	Nov. 15
Consolidated Utilities, pf.....	1¾	Nov. 1
Consumers Power, 6% pf.....	1½	Jan. 2
Consumers Power, 6.6% pf.....	1.65	Jan. 2
Consumers Power, 7% pf.....	1¾	Jan. 2
Consumers Power, 6.6% pf. (mo.)†	55c	Nov. 1
Consumers Power, 6.6% pf. (mo.)‡	55c	Dec. 1
Consumers Power, 6.6% pf. (mo.)‖	55c	Dec. 15
Dallas Power & Light, pf.....	1¾	Nov. 1
Houghton County Electric Light...	75c	Nov. 1
Mobile Electric, pf.....	1¾	Nov. 25
Pacific Power & Light, pf.....	1¾	Nov. 1
Southeastern Mass. Power & Elec.	2	Nov. 15
Southeastern Mass. Pr. & El., extra	1	Nov. 15
Tennessee Electric Power, 2d pf...	$1.50	Nov. 1
West Penn. cumulative pf.....	1¾	Nov. 15
Fairbanks, Morse & Co., pf.....	1¾	Dec. 1

* Payable in participating preferred.
† Holders of record Oct. 15.
‡ Holders of record Nov. 15.
‖ Holders of record Dec. 15.

Superpower Stock Listed on Curb.—The class A and class B common shares of the American Superpower Corporation of Delaware, the capital set-up of which was discussed in the October 18 issue of the ELECTRICAL WORLD, have been admitted to trading by the New York Curb Market.

Georgia Utility Increases Stock.—The stockholders of the Savannah Electric & Power Company have authorized an increase in capital stock from $4,800,000 to $5,300,000, designating the new stock as series B first preferred or debenture stock. The directors are planning to offer $250,000 of this stock at par, $100 a share, following the approval of the issue by the Georgia Public Service Commission. The proceeds of the sale will be applied toward the retirement of the bank debt of the company incurred for additions and improvements and to provide funds for further additions.

Utica Gas & Electric Notes Mature.—Among the public utility group of maturities during November, which, incidentally, are unusually light, is an issue of 7 per cent notes of the Utica Gas & Electric Company amounting to $1,500,000. The date of maturity is November 1.

Detroit Edison Reports Net Income Gain.—The Detroit Edison Company for the nine months ended September 30, 1924, showed net income amounting to $4,013,265, equal to $9.02 a share on the $44,508,200 capital stock outstanding, against net income of $3,248,897, or $7.48 a share, on the $43,405,900 capital stock outstanding in the same period of 1923.

No Public Offering of Columbia Gas & Electric Stock.—No public offering will be made of Columbia Gas & Electric 7 per cent cumulative preferred by the syndicate that recently underwrote the fifteen-million-dollar offering to stockholders. Only 10 per cent was left after the shareholders exercised their rights, and the bankers disposed of this small balance privately.

A. T. & T. Report.—The report of the American Telephone & Telegraph Company for the nine months ended September 30 shows estimated net income of $64,711,680 after charges and federal taxes, equivalent to $8.31 a share on the $778,881,600 average amount of stock outstanding during the period. These figures compare with $61,256,142, or $8.56 a share, on $715,454,300 average stock outstanding in the corresponding period of 1923.

Middle West Utilities to Redeem Bonds.—With the purpose of paying off at par and accrued interest all of its ten-year 6 per cent bonds, maturing January 1, 1925, the Middle West Utilities Company has deposited with the Illinois Merchants' Trust Company of Chicago $6,246,500. Payment of these bonds leaves the company without maturing obligations until September 1, 1935. The only outstanding senior obligations of the company following the redemption of the bonds will be notes totaling $5,844,500.

Barcelona Traction Issues Annual Report.—The Barcelona Tractior Light & Power Company, Ltd., has issued its ninth annual report, covering activities for the year ended December 31, 1923. The figures show increased earnings—$2,726,973, as compared with $2,575,465 during 1922 and $2,065,537 during 1921. No important change appeared in the balance sheet, the decline in the rate of exchange of the peseta continuing as a retarding factor. Recently the company increased its capitalization through the issuance of $17,500,000 non-cumulative participating 7 per cent preference stock and at the same time reduced the par value of the common stock from $100 to $50.

Turners Falls Company Files Application.—The Turners Falls Power & Light Company has applied to the Massachusetts Department of Public Utilities for authority to issue at par ($100) 3,634 additional shares of common stock. If authorized, the funds from this issue will be used to retire indebtedness incurred in making additions and improvements.

Calumet Gas & Electric Files Petition.—A petition for authority to issue and sell $4,545,926 of securities has been filed with the Indiana Public Service Commission by the Calumet Gas & Electric Company. The company, which is an Insull property, was authorized by the commission on October 6 to buy and merge fourteen other northern Indiana utilities. Of the total amount of securities asked to be authorized, $3,568,492 is to buy the property and assets of the fourteen utilities, $524,433 is to reimburse the company's treasury for capital expenditures for the five-year period ended July 31, 1924, and $453,000 is for refunding purposes.

Commonwealth Power Earnings.—Earnings of the Commonwealth Power Corporation and subsidiaries for the twelve months ended August 31, 1924, applicable to dividends and depreciation amounted to $5,971,749, or $24.88 per share on the $24,000,000 preferred stock and $22.66 per share on the 200,000 shares of common stock. After provision for depreciation, earnings amounted to $16.48 per share on the preferred and $12.57 on the common as compared with $13.06 and $8.47 respectively for the same period last year.

Change in Capitalization of Consumers Power Company.—The stockholders of the Consumers Power Company, Jackson, Mich., were to vote October 24 on changing the 200,000 shares of authorized common stock, par value $100, to 1,400,000 shares of authorized common stock having no par value and authorizing the issue of seven shares of this no-par stock in exchange for each share of common stock of $100 par value. At that time they were to vote on increasing the authorized number of preferred shares, par value $100, from 300,000 to 500,000 and the number of common shares having no par value from 1,400,000 to 2,000,000.

Indiana Corporation Files Petition.—The Indiana Electric Corporation, one of the original Joseph Brewer companies, which passed into the control of the Insull interests of Chicago a short time ago when the latter acquired control of the Central Indiana Power Company, the holding company for Brewer's Indiana interests, filed a petition with the Public Service Commission on September 18 asking for permission to issue and sell $496,000 worth of common capital stock, $496,000 worth of 7 per cent preferred stock and $1,841,000 in bonds, a total of $2,833,000. The proceeds from the sale of these securities are to be used in completing the construction of the superpower plant of the company at Dresser, south of Terre Haute.

Recent Court Decisions

Definiteness in Declarations in Damage Suits—Validity of Award Not Attackable by Negligent Third Party.—The Maryland Casualty Company sued the Union Bridge Electric Manufacturing Company to recover damages paid under the workmen's compensation act of Maryland for the death of a man working for the board of education of Carroll County, the casualty company having insured the board against such liability. The Court of Appeals of Maryland sustained the plaintiff against the contention of the defendant company that a declaration alleging that death was directly caused by negligence of defendant's agents and servants in maintaining an unprotected, highly charged wire within a few inches of the roof of a schoolhouse on which deceased was working, and without negligence on his part, was indefinite and did not allege a sufficient cause of death. The court also found that the validity of an award of the State Industrial Accident Commission cannot be attacked by the one whose negligence caused employee's death, when sued by insurer, his liability not being affected by the fact of the award or the amount of it. (125 At. 762.)*

That Wires Were Uninsulated Does Not Permit Recovery for Injury to Lineman Where Usual Care Was Exercised by Employer.—Damages for injury to a lineman who came in contact with the high-tension wires on which he was working were awarded by a jury in Milligan vs. Kansas City Light & Power Company on the ground that the wires were not insulated. The Supreme Court of Missouri has upset the verdict of the lower court, maintaining that, although an employer owes to his employees the duty to make safe the place where they are required to work, he is not liable as an insurer. He is bound only to exercise reasonable care, the degree depending upon the danger attending the employment, and the standard being the care exercised by prudent employers under similar circumstances. "The facts of the instant case clearly bring it within the influence of this universally accepted doctrine," said the court. "The place where plaintiff was required to work was dangerous. The defendant might have made it reasonably safe by insulating its wires, if that were practicable in the construction of which they formed a part. Instead of doing that, however, it followed the usage that obtained among employers generally under similar circumstances. It furnished its employees, including plaintiff, with safety appliances which would fully protect them. It must be held, under the facts disclosed by this record, that in so doing it discharged its full duty to them." Testimony that the rubber gloves supplied by the company which the victim might have worn but did not were defective and useless had, the court said, no bearing on the case, which was based on the claim that non-insulation of the wires provided a cause of action. (264 S. W. 408.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Confiscation as It Applies to the Consumer. — Declaring that "the utility patron is entitled to have his property protected from confiscation to exactly the same degree as the utility operator," the Indiana Public Service Commission, in justifying a recent refusal to grant increased rates to a petitioning company, said further: "An inadequate rate confiscates the property of the utility. By exactly the same rule of law an excessive rate confiscates the property of the utility patron. An excessive utility rate takes the property of the patron without due process of law just as effectively as an inadequate rate thus takes the property of the utility. The utility patron is entitled to have his property protected from confiscation to exactly the same degree as the utility operator. If not, then he fails of the equal protection of the law guaranteed by the Fourteenth Amendment. The petitioner has appealed to the commission to save its property from confiscation by its patrons through alleged inadequate rates established by itself. The burden is on the petitioner to make its case. The facts as to real history of the existing property are undisputed. If these undisputed facts establish the necessity for an increase in its rates to prevent the confiscation of its existing property by its patrons, then its petition should be granted."

Average Water-Power Conditions Are Held to Govern Rates Even with Unprecedented Drought.—As reported in the news columns of the ELECTRICAL WORLD last week, the California Railroad Commission has by a three-to-two vote rescinded its order of last summer granting to the Southern California Edison Company a temporary rate increase of 10 per cent to assist it to meet the abnormal expense of the great drought. In handing down the new decision the majority commissioners said that for several years the company, the Railroad Commission and the public have accepted the principle that rates should be fixed upon the basis of average water-power conditions. Variations in operating expense during the last few years have been absorbed by the company through the medium of a contingency reserve. Had 1924 conditions not been so extreme, it is asserted, there is no doubt that the resulting expense would also have been absorbed by the company without asking relief, even though in so doing the company somewhat more than exhausted the contingency reserve. "The policy of considering wet and dry years upon an average basis having been adopted and having given satisfactory results for a number of years," the decision says, "it is apparent that the present year should be taken into the average rather than given special treatment if, by so doing, no detriment to the public interest results." The decision further asserts that it is realized that without an increase of rates the company will be unable to sell any bonds for approximately one year, but this is due to mortgage provisions, not market conditions. Conditions caused by drought not being similar to those created by loss of business due to competition or decline of population served, and being temporary, they will be unlikely to have any serious or lasting effect on the company's credit and will not seriously affect the company's ability to proceed with necessary construction work or enhance the cost of money. They have, on the other hand, produced unusual problems to the company's consumers, due to general economic depression, the curtailed use of electric power made necessary by the drought and the inability of the company to meet demands made upon it. The fixing of rates, therefore, upon average rather than special conditions is highly desirable, decision says, as it eliminates objectionable fluctuations and distributes the burden over several years that otherwise would be concentrated in a single year. In the dissenting opinion it is pointed out that after using all of its contingency reserve the company is still $2,472,000 short of the 7½ per cent return it is permitted to earn. The original decision in the proceeding would have permitted the company to earn 6¾ per cent on the investment in the property devoted to the public service and thus have divided between the company and the ratepayers on a fifty-fifty basis the extraordinary expense of the company in serving the public. It is now proposed to spread years.

The dissenting commissioners object to doing this, asserting that it would result in consumers who will receive little if any benefit from the increased expenditures being required to pay over a long period of years for the company's 1924 deficiency in revenue. This would, in effect, they say, leave in the hands of future commissions the duty of reimbursing the company for necessary and admitted expenditures which in equity the company is entitled to be reimbursed for now. They point out that the present commission will have no power to bind its successors to such a course. In concluding they say: "We feel that if some consideration is not to be given to the extraordinary cost incurred in purchasing and in producing power to keep the wheels of industry moving as rapidly as possible this year, and if all of these extraordinary expenditures must be borne in their entirety by the company, there will be little, if any, incentive under similar conditions in the future for any utility to go to such lengths and incur such costs as did the Southern California Edison Company this year in its endeavor to serve its consumers."

Manufacturing and Markets

Profit Sharing in Electrical Appliance Sales

The Experience of Eight Years in Chicago Shows Many Practical Advantages—Now Spread to Other Localities

By H. C. Hueglin
Secretary and General Manager Federal Profit Sharing Company

THE use of profit-sharing coupons to stimulate the sale of domestic appliances out of the electric shops of the Commonwealth Edison Company, Chicago, has been in continuous operation for the last eight years. It has come to be a considerable factor in the local distribution of electrical merchandise.

Coupons are purchased by the Commonwealth Edison Company and about eighteen hundred merchants of Chicago at a price of 0.1 cent each, and these in turn are issued to customers at the rate of one coupon for each 5-cent purchase. This is equivalent to a discount to the purchaser of 2 per cent, but it has the advantage that the discount must be turned back into the purchase of electrical apparatus. In some cases, such as special campaigns on specific items, additional coupons are offered to attract purchases. All coupons issued either by the Commonwealth Edison Electric Shops or neighborhood merchants are redeemable only in the electric shops of the Commonwealth Edison Company, where they are accepted the same as cash in payment for merchandise at the rate of $1 per 1,000. Electric shops turn the coupons so redeemed back to the Federal Profit Sharing Company, which reimburses the electric shops for the merchandise given out.

By this procedure there is a two-fold benefit to the electric shops: First, the sale of electrical merchandise is encouraged by giving coupons with each sale which are equivalent to a 2 per cent discount; second, additional electrical goods are put out when the customer has accumulated a number of the coupons and redeems them for other electrical devices. The usual practice of the customer is to accumulate three or four thousand coupons and apply them as an initial payment of $3 or $4 on some article of much higher value, paying the balance in cash. Federal coupons are now being issued at the rate of about fifteen million per month, and redemptions call for about $10,000 worth of merchandise per month.

Free Certificates

In addition to this, to stimulate the desire to save coupons, and also to create a large attendance in the electric shops, one free certificate is inclosed with each electric light bill, regardless of whether the bill is for $1 or $10. Upon presentation of the certificate at the counter in the electric shop, the customer can receive thirty regular coupons for it which have a value of 0.1 cent apiece. The position of this counter in the store is such that it will be necessary for the customer to pass through the entire showroom to reach it, thus forcing the customer to see practically all of the merchandise displayed. The certificates inclosed with each monthly bill have an expiration date, so that each customer must come into the store personally each month and cannot accumulate certificates over a period of months and then come in to make the exchange only once or twice a year.

At the present time there are 700,000 of these certificates sent out with electric light bills each month, and a recent check indicated that more than 20 per cent of them are presented for exchange, thus creating a very large attendance in the electric shops—about 150,000 persons per month.

These certificates are not considered a discount on the electric light bill, but rather an advertising expense of the electric shops, which must pay for them. Because of the large number of people brought to the electric shops thereby, however, the small advertising expense of 3 cents per customer who actually visits the shops is considered a good investment. Furthermore, the certificates inclosed with the electric light bills provide considerable advertising space, which is sold to electrical manufacturers.

This method of creating attendance in the electric shops has proved so successful that the Federal Profit Sharing Company has extended the same plan to two other concerns in Chicago, namely, the Continental & Commercial Trust and Savings Bank and Lyon & Healy, and proposes to extend it to three other prominent companies also in Chicago. The certificate inclosed with the electric light bills now contains three stubs, each exchangeable for thirty coupons, one at the Commonwealth Edison Electric Shops, one at the Continental & Commercial Trust and Savings Bank and one at Lyon & Healy's store. Thus attendance is created each month at the above-mentioned places and customers accumulate coupons rapidly, resulting in increased electrical merchandise sales. By receiving thirty coupons free each month at six different places, a total of 180 are distributed to each customer, having a purchasing value of 18 cents. If the same percentage of exchange is made at each place, a total of about 25,000,000 coupons will be distributed by this method each month. These coupons have a purchasing value in the electric shops of $25,000. Each one of the concerns using this method of creating attendance enjoys an extremely large traffic at an advertising expense of only 3 cents per customer actually brought into the store, and the electric shops receive the benefits of the sale of $25,000 worth of merchandise.

Sources of Profit

The profit-sharing company has four principal sources of income:

1. Unredeemed coupons. For example, in Chicago, where fifteen million coupons are issued each month to electric shops, outside merchants, etc., they receive $15,000. Of these coupons about 75 per cent of the total are redeemed, so that it is necessary to pay the electric shops for the ten million redeemed, or $10,000, leaving a difference of $5,000, of which 25 per cent is profit and 75 per cent is set up in a reserve fund for the redemption of coupons.

2. Interest on a large reserve fund established for the redemption of unredeemed coupons. A period of

fifteen to twenty years is allowed for the redemption of these coupons. In the meantime the interest on the fund accumulates.

3. A working agreement with the electric shops to receive a 10 per cent discount from the retail list price of any article exchanged for coupons. Thus for every $5 worth of coupons redeemed only $4.50 must be paid.

4. Advertisements of appliance manufacturers appear on the certificates sent out with the electric light bills, this space being sold to appliance manufacturers.

The merchants other than the electric shops are by far the greatest distributors of the profit-sharing coupons. The benefit to them comes from the inducement which these coupons exert upon the public to purchase merchandise of them. The electric shops receive their chief benefit from the sale of additional electrical merchandise which the coupons induce. In addition, the profit-sharing company has become a very large purchaser of electric appliances and as such has been able to supply the various companies with which it is interested with merchandise at attractive discounts.

On the strength of this well-tried experience in Chicago, this system of stimulated household appliance sales has been extended to a number of cities in Michigan by the organizing of a profit-sharing company in which the Hodenpyl-Hardy company is jointly interested. The plan is now actually operating in conjunction with the central-station properties in the cities of Grand Rapids, Jackson and Battle Creek and is being rapidly extended to other cities served by the Consumers Power Company, a Hodenpyl-Hardy subsidiary. A similar development is also being organized in certain Pennsylvania cities. It has developed to a volume past the experimental stage and seems to offer a system of distribution for electrical domestic equipment that is worth consideration by any central-station company that desires to build up residence load.

The Cost of "Overhead"

"OVERHEAD" is an outgrowth of a mode of organization, and as an enterprise develops it gradually takes on overhead, or rather it takes on overhead so that it may develop. A sixteen-page pamphlet entitled "The Cost of Overhead," issued by the Metropolitan Life Insurance Company, Policyholders' Service Bureau, discusses this subject and points out the need for having each department self-sustaining and carrying its proper share of overhead expenses. The accepting of orders on incomplete costs is carefully taken up, and conditions are mentioned when this is necessary. Further, it is shown that overhead is susceptible of accurate measurement, and it can definitely be determined whether it is profitable to take on additional overhead.

Electric Range Needs Better Selling

Extravagant Claims, Fear of Price and Too Much Need for Service Has Held Range Back—Quality and Selling Will Find Ample Market

BY DEXTER ROLLINS
Manager Electric Range Division, Michigan Stove Company, Detroit

ALTHOUGH it has perhaps a higher sales resistance than any other article of household equipment, the electric range is a piece of merchandise and should be sold as such. It has been slower in coming into popularity than numerous other relatively new things, both electric and otherwise, and one of the causes for this is improper exploitation. The general public has come to expect, and with good reason, that all things electric carry superiority, but entirely too much advantage has been taken of this fact. Too many extravagant claims have been made, too much "bunk" has been freely distributed, so much so that the buying public has come to view with suspicion many of the claims made for electric cooking.

Particularly in the development stage have many of us been too optimistic concerning the miraculous results from cooking by electricity. There is nothing miraculous or wonderful about it at all, and in past years, in many instances, it has not been even satisfactory or practically efficient. And a great deal of our sales resistance now is due to past —and in many cases present—misrepresentations. Housewives have been misinformed as to operating costs, been misled into believing that an electric range could transform a poor cook into a good one, some almost believing that if a pile of ingredients were placed on the kitchen table at noon, upon return from an afternoon of pleasure a complete dinner would be immediately available. Housewives are willing to believe almost anything about electricity, and if they are told actual facts, no alibis or apologies will be necessary.

Electric ranges, of course, should be exploited only where all conditions are favorable from the consumers' standpoint. We shall get nowhere on any other basis. There are communities where for one reason or another, under existing conditions, electric ranges should not be sold at all. It is not a question of a particular electric utility being unfavorable toward electric range load. Undoubtedly this load is not now desirable in many places, but that is only postponement of the inevitable. When the public demands electric ranges, the electric utility will find ways and means of satisfying the demand and making it a profitable business for both. At the same time, in communities where electric ranges are marketable there are individuals who should not buy them, families which for one reason or another would not be satisfied with electric cooking.

Heretofore the two old outstanding objections to electric cooking have been lack of ruggedness and lack of speed. You will forgive me if I say that the range I am particularly interested in has overcome these two objections to a very remarkable degree, to such a degree that I doubt if the average housewife would notice any difference in speed in either top or oven cooking in comparison with the best gas stove. On the question of ruggedness and dependability of electric ranges I suppose I am rabid. There is too much talk about service. Frequently in trade journals and at meetings elaborate suggestions are outlined for servicing electric ranges. That is the big trouble. There has been too much need for service. Electric ranges shouldn't need all this continual service like a newborn baby. Gas ranges don't.

Owing to a large extent, to central-station demand, manufacturers are trying to build electric ranges to a price rather than quality. Of course, the cost of electric ranges is too high; but the only solid basis on

which price can be reduced is that of production, and just so soon as there is a fairly general cooking rate with a maximum of 3 cents per kilowatt-hour electric ranges will grow into popular favor and demand. The electric utility sales manager had better sell one hundred ranges of high quality than one thousand of the kind that bring trouble and dissatisfied customers, for in the latter event he is not consistent with the ideals and general achievements of the electrical industry.

PRICE NO OBSTACLE

It is education that is necessary—first to sell electric ranges, second to keep them sold. Then they will automatically sell others so that a production of sufficient volume will enable the manufacturer to cut his cost and his selling price. He is just as anxious as any one else to do that very thing. Every day, nearly, I am told: "Yes, your product is worth the cost, but it is too high-priced to sell." What about the woman who thinks nothing of paying $150 for a washing machine that is used two or three hours one day a week? She has been educated to it, and there are more washing machines sold at $150 than at $100—a great many more.

Some leaders in our electrical merchandising field cry that gross profit is too small, they must have more margin. If they would apply the same diligence in building efficiency into their merchandising departments that has been used in the manufacturing, operating and distributing divisions of the modern electric utilities, the consumer of the merchandise would benefit and as a natural consequence all the rest of us would also prosper.

Electric ranges can be merchandised just as effectively as any other household commodity, with the quality of merchandise just as essential as the quality of electric energy, with the same intelligence applied as is applied to the main product of the central station. But every community differs from another just as individuals differ, and no set rule of merchandising can be outlined.

It is the duty of the central-station company to pioneer this market. This is a responsibility and burden which the industry has always assumed with pride, has always assumed as an obligation upon the public utility, and has assumed with ever-decreasing costs to the public and generally a fairly satisfactory profit to itself.

Business Conditions

BUSINESS has settled down to a steady ordering of materials for maintenance purposes, with industrials placing such orders in better volume. It is evident that the settlement of the political situation is being eagerly awaited. After this it is believed that business should gradually improve since the fundamental conditions are sound. Export business has been decreasing with the gradual strengthening of Germany's economic development. However, the feeling among prominent exporters is that this was to be expected and that it is for the best interests of all nations. There still remain plenty of markets where aggressive development can produce a healthy business.

Orders received by the Westinghouse Electric & Manufacturing Company during the quarter ended September 30 were valued at $34,705,000, which is a decrease of 13 per cent as compared with the previous quarter. The value of General Electric sales, as reported in the ELECTRICAL WORLD last week, also showed a decrease. However, since that time there has been somewhat more activity in the electrical industry. The report of the Otis Elevator Company this week shows earnings of $2,973,867 for the nine-month period ended September 30, as compared with $2,423,008 for the year 1923 — greater than any full-year period in its history.

In the New England district sales of line material and wiring devices dominate trade, and appliance sales are improving slowly. Business continues spotty in the New York district, with sales of supplies continually increasing. In the Southeast business is marking time pending the outcome of the election. Utility purchases of distribution material in this section are very good. Trade remains stable in the Middle West, central-station construction continuing with increased activity. On the Pacific Coast power company business has lessened to a winter basis, but it is expected to be very good next year, especially in southern California, where much very necessary construction work was prevented by the drought.

Radio Apparatus Sales Continuing Unabated

SALES of radio equipment by various radio apparatus manufacturers continue to show a large increase. Interest of the public not only shows no sign of falling off but is being daily augmented by the addition of converts to radio. The Radio Corporation has reported 75 per cent greater sales for the first six months of 1924 than for the same period last year and current sales are well above this figure.

There are few industries which can point to such a rapid growth with every evidence of the increased volume of sales being sustained. Further evidence of rapid growth and stability of the industry was recently shown when the Radio Corporation of America applied for permission to list its stock on the exchange with the agreement that quarterly statements will be published subject to the deductions of federal taxes and amortization of patents. The dealer who sells poor supplies and equipment is no longer a factor in the industry, and as the public is gradually educated in the judgment of the worth of radio merchandise the stability of the industry will be further strengthened.

Data collected by the Department of Commerce at the biennial census of manufacturers show that radio apparatus to the value of $43,460,676 was manufactured during the year 1923 for sale as such. This total includes 1,889,614 head sets, valued at $5,352,441; 508,001 loud-speakers, valued at $5,620,961; 414,588 receiving sets of the tube type, valued at $12,065,992, and 116,497 receiving sets of the crystal type, valued at $550,201, together with other items.

The manufacture of 2,601,575 radio tubes, valued at $4,572,251, was reported separately. A part of these tubes were sold to manufacturers to complete receiving sets (and their value is therefore included in the total value of such sets, as given above), and the remainder were sold to individual purchasers for use in the construction of home-made sets.

August Electrical Exports Show Big Improvement

THE electrical export trade is enjoying a satisfactory trend, and the total trade figures for the present year show every indication of being well above those of last year, according to the electrical division of the Department of Commerce. Current sales, however, are decreasing. Preliminary figures (see tabulation, page 822, ELECTRICAL WORLD, October 11) show that the exports during August of this year were more than 17 per cent above those for August, 1923, comparative totals being $7,188,370 and $6,108,894. Generating equipment showed a very considerable increase in both direct-current and alternating-current apparatus of all classes, and even farm-lighting plants were practically double in value as compared with the same month of last year.

Switchboard panels show a very heavy decrease compared with the same month of last year, though there was a good gain made in the exports of power switches and circuit breakers as well as in lightning arresters and similar accessories for generating and distribution equipment. Motors have not shared the gains registered by generating apparatus, though there was only a slight decrease in motors of 1 hp. and less.

In the field of wiring devices and materials substantial increases are shown. Exports of metal filament

lamps have increased considerably as compared with the same month of 1923, the figures being respectively $114,212 and $87,566. A satisfactory gain is registered in the electric fan class, where the exports were $73,922 as compared with $63,034 for the same month of 1923. As might be expected, exports of radio and wireless apparatus show a considerable increase over the same month of 1923, the total value of shipments during August, 1924, being $541,238 as against $307,127 for the same month of the previous year. Influenced to some extent by the world-wide interest in radio, exports of both primary and storage batteries have also held up well. Exports of bare copper wire show a slight decrease during August as compared with the same month of 1923, and the same is true of electrical carbons, both of which classes had slumped heavily during July of 1924, as compared with the previous year.

Porcelain Sales Increasing—Upward Trend Indicated

THE porcelain business is improving, and there is every indication that sales for the current year will exceed the good year enjoyed during 1923, according to H. S. Freeman, sales manager of the Square D Company's porcelain plant, Peru, Ind. The hand-to-mouth buying which marked a few earlier months of the year seems to have disappeared and buyers have a tendency to anticipate their demands further in advance. An increase in business from manufacturers who buy porcelain parts for their equipment indicates that their own sales are steadily increasing.

Non-Ferrous Metal Prices Advance Under Foreign Influence

FURTHER advances have occurred among the non-ferrous metals in the last week. A good demand in Europe has been the chief reason for this as well as corresponding advances in the London metal market. Lead and zinc have been in very good demand in the New York market, while copper has been comparatively inactive but firm in price. Last week, Thursday, Friday and Saturday the demand for copper was reasonably good and sales were made at 13⅜ cents. However, early this week inquiries were few, but quotations have been firm at 13¾ cents, and foreign business has been sufficiently good so as to make most of the producers independent of any temporary lull in the domestic market. Wire and brass mills have been the chief buyers during the week. Most of their demands have been for deliveries extending from November through January.

The American Smelting & Refining Company advanced its official contract price for lead from 8 cents to 8¼ cents per pound on Monday, October 20. Consumers entered the market actively with the result that other than the principal producers were selling substantial tonnages as high as 8.5 cents and 8.55 cents, although some producers are supplying limited tonnages to regular customers at 8 cents.

NEW YORK METAL MARKET PRICES

	Oct. 15, 1924 Cents per Pound	Oct. 22, 1924 Cents per Pound
Copper, electrolytic	13⅜	13⅜
Lead, Am. S. & R. price	8	8¼
Antimony	11⅛–11¼	11⅛–11¼
Nickel, ingot	29–30	29–30
Zinc, spot	6.65	6¾
Tin, Straits	49¾	51⅛
Aluminum, 98 to 99 per cent	28	28

Sales of zinc to galvanizers have been larger than for some time, probably owing to the advance in price which followed the London market. Tin prices have again risen to the levels of early September, and the market was fairly active early in the week. Consumers, however, have been somewhat indifferent about laying in forward supplies.

Supply Orders Dominate Trade in the New England District

SALES of line material and wiring devices in well-distributed orders from central stations and contractors feature this week's business in New England. Utility interests in Greater Boston purchased $20,000 worth of poles in one order, and pole-line hardware was in active demand. One Boston jobber sold a carload of weatherproof wire to Connecticut and another sold 600 industrial lighting reflectors for Massachusetts use. The open weather is favoring both outside and inside construction. In the apparatus field many "propositions" are pending, but commitments are held back, apparently pending the outcome of the election. Manufacturers have no hesitancy in declaring that political attacks upon the Federal Constitution must be relegated to the class of defeated enterprises before business can go forward with confidence. A New Hampshire paper mill bought a 750-kw. turbo-generator this week.

Appliance sales are picking up slowly, and vacuum cleaners are moving well. Portland, Me., purchased 100 this week from a Boston wholesaler. There is much radio business and some higher-grade sets are not easy to obtain. Portable lamps and fixtures are selling more actively.

Sales Spotty in New York District —Volume of Business Fair

BUSINESS in the New York district continues to be spotty. The last week has been rather quiet with the exception of the sales of supplies, which have been continually improving. Manufacturers report, however, that several small orders have been received which in the aggregate have amounted to a fair volume of business. Motor sales to date this year are on a basis of about 60 per cent of last year's sales. Export sales have been decreasing somewhat and are not so good as formerly. Electrical exports as at present reported by the Department of Commerce continue to show an increase, such exports being, of course, the result of sales made in some cases several months ago, but current business is decreasing.

Sales by jobbers continue to show an improvement, with the total sales for September better than a year ago, and October sales evidently will also, from present observations, be higher than a year ago. In general the situation is classed as very encouraging, which is partly attributed to more diligent seeking after business with the help of prices which are holding firmer.

Business in the Southeast Marking Time—Utility Purchases Good

BUSINESS in the Southeast appears to be marking time until after the presidential election, but the middle of November is expected to show a decided pick-up in all lines. Central-station purchases of poles, pole-line hardware and wire are very good, the orders coming from the section generally. The expansion of central-station and municipal distribution systems is reflected in the increased movement of 5-amp. and 10-amp. meters, the most satisfactory orders coming from Florida. Transformers in sizes from 1½ kw. to 10 kw. are selling satisfactorily.

Electrical jobbers report their business as generally good but there is no activity of moment in any particular line. Dealers are giving some attention to holiday requirements, and jobbers are beginning to receive orders for hollow-ware and holiday goods, though the movement in this line will not actively get under way for several weeks. A big holiday business is expected and wholesalers' stocks have been accumulated accordingly. The movement of air heaters is very good, and fall prospects in this line are bright. The demand for dry batteries for radio use is very satisfactory, but it is not as good for ignition and bell-ringing use owing to the low price of the bell-ringing transformer.

Trade in Middle West Stable—Utility Construction Active

CENTRAL-STATION construction in the Middle West continues with increased activity in the Dubuque (Iowa) district and throughout the entire state of Indiana. Additional contracts for smaller substations are being placed, while maintenance purchases have increased materially. Distribution equipment is most in demand, a sizable order for transformers having been received by one manufacturer. The demand for high-tension equipment remains good, and good sales of watt-hour meters have been made. An interesting order for outdoor lightning arresters was placed by one utility this week. It would appear that prices have reached a level at which they will remain at least until after election, although the increased demand for most commodities lends an upward trend to the market.

Jobbers report continued good business. No unusually large orders were received, but the volume of business transacted remained good. Appliance sales have increased; one manufacturer of washing machines reports having received a single order for 500 machines. The active campaigns for better lighting equipment are apparently having their effect, as the demand for

kitchen units has been unusually large. Building activity continues, however, the number of permits obtained for the week fell below last year's mark—249 as against 385 last year—although the amount of money involved is about the same.

Power Company Purchases Off on the Pacific Coast

POWER company business on the Pacific Coast has lessened to a winter basis, although an order for 5,000 insulators is reported from a central California company. Such business is expected to be very good next year, especially from southern California, where much very necessary construction was dammed up by the drought. Sale of hydro-electric equipment in the northern section of the Pacific Coast which was quoted on some time ago has not yet materialized, and it is believed that no action will be taken until after election, when the Bone bill, of particular interest to public utility companies, will be placed before the voters. Several orders of from 100 to 500 furnace transformers distributed over San Francisco, Oakland and Los Angeles are reported by jobbers. A series of pageants held in the San Francisco section has resulted in large sales of wire and open-type wiring devices, 40,000 weatherproof sockets having been sold by one manufacturer.

The good rains which continue have noticeably improved retail business, and building is still good, although some work is being held in abeyance pending the political outcome. Some recent unfortunate experience of companies financing time payments on appliances may react upon such business, which, although somewhat slower than last year, is conducted upon more conservative lines. Radio business is very good, though much of the high-priced business is reported as being obtained by musical supply houses. Prices in general are steady except for rubber-covered wire, which has decreased about 3 per cent.

Activities of the Trade

Walker Vehicle Moves Offices in New England

The New England headquarters of the Walker Vehicle Company have been moved from 592 Commonwealth Avenue to 75 West Dedham Street, Boston. At the new address 30,000 sq.ft. of floor space will be available for sales department, office, garage and service station uses, compared with 12,000 sq.ft. at the former location.

Writ to Review General Electric Lamp Patent Case Denied

The Save Electric Corporation has failed in its effort to obtain a reversal of judicial decisions adverse to it and in favor of the General Electric Company in a case involving infringement of the Just and Hanaman and other patents concerning incandescent lamps, these patents being controlled by the General Electric Company. The United States Supreme Court on October 20 declined to grant a writ of certiorari to review the case. The Save Electric Corporation alleged that all facts had not been developed fully before the lower courts.

American Metallurgical Furnace Sales Increasing

More than twice as many electric furnaces will be sold in 1924 as in 1923 by the American Metallurgical Corporation, Boston, according to a recent statement by President K. A. Juthe. The company is outgrowing its factory facilities and is now considering a relocation. Recent sales include a 30-kw. duplicate lead-pot furnace to Pratt & Whitney, Hartford, Conn.; a 70-kw. nickel-silver annealing furnace to the Hookless Fastener Company, Meadville, Pa.; a 35-kw. air-heating furnace to the F. N. Burt Company, Buffalo, N. Y.; a 30-kw. electric central oil-heating unit for saw tempering to the American Saw & Manufacturing Company, Springfield, Mass.; a 15-kw. heat-treating furnace to the Clayton Manufacturing Company, Bristol, Conn., and a heat-treating furnace to the De Laval Separator Company, Poughkeepsie, N. Y. New applications are also constantly absorbing the attention of the engineering department.

The following sales representatives have recently been appointed: E. A. Eddy Machinery Company, Providence, R. I.; Ideal Machinery Company, Plainville, Conn.; Ralph C. Schwarz, 943 Granite Building, Rochester, N. Y., and A. C. Wright, 3 Post Office Square, Springfield, Mass.

Otis Elevator Company Earnings Highest on Record

The statement of the Otis Elevator Company for the nine months ended September 30 shows earnings greater than for any full-year period in its history. The net earnings reported for dividends on preferred and common stocks is $2,974,867 as compared with $2,423,008 for last year. These earnings represent to some extent business which was booked a year ago and even earlier. However, incoming business is said to be good.

W. D. Baldwin, chairman of the board, is now in Europe looking over the situation abroad, and it is anticipated that some large contracts may be forthcoming after his return. There has been considerable improvement in business abroad this year, but the earnings of the foreign subsidiaries are negligible compared with the earning power in this country and are not likely to affect the company's position to any great extent.

Pittsburgh Transformer Company Purchases Adjoining Property

The Pittsburgh Transformer Company has just purchased another piece of land for future extension. The property, consisting of about two acres, adjoins its Juniata plant and extends from the Pennsylvania Railroad to the Ohio River. It is served by the Baltimore & Ohio and the Pennsylvania railroads. The property was purchased from the Duquesne Light Company, and there are erected on it two brick buildings formerly used by that company.

Westinghouse Orders Show a Decrease of 13 per Cent

Orders received by the Westinghouse Electric & Manufacturing Company for the quarter ended September 30 show a decrease of approximately 13 per cent compared with the previous quarter. The value of the orders was $34,705,000 against $40,030,000 in the quarter ended June 30 and $41,940,000 in the corresponding period ended September 30, 1923. Sales billed for the last quarter were $39,573,000, against $38,260,000 in the June 30 quarter and $38,619,500 in the same quarter of 1923.

Since April 1, the beginning of the present fiscal year, the company booked $74,735,000 of new business, compared with $89,589,000 in the same period of 1923. Billings for the six months aggregated $77,833,000 against $73,714,300 in the corresponding period last year.

Southeastern Electric New Jobbing House in Chattanooga

The Southeastern Electric Company has been recently organized in Chattanooga, Tenn., to take over the electrical department of the James Supply Company. A steady growth of the electrical business of the supply company, together with the need of greater facilities for this department, has made it necessary to separate the business.

I. L. Faucett, for years manager of the electrical department of the James Supply Company, will be in active charge of the new company. The majority of stock in the new enterprise is held by the stockholders of the supply company.

The Sangamo Electric Company, Springfield, Ill., is now providing its type HM demand register with a synchronous motor, known as the Sangamo induction-reaction motor, which assures equal time intervals in the register.

The Edison Electric Appliance Company, Chicago, has (effective November 1) appointed W. T. Christy of the Chicago office of the company as acting Southern district sales manager to succeed Linn T. Piper, who has resigned to become connected with the Oil Heating Company, Chicago.

The Ward Leonard Electric Company, Mount Vernon, N. Y., announces the appointment of the Dominion Engineering Agency, Ltd., D. M. Fraser president, as sales representatives in Ontario, Canada, to handle the complete line of Ward Leonard control and resistance apparatus.

Harvey Hubbell, Inc., Bridgeport, Conn., manufacturer of electrical specialties, is now placing on the market a new portable convenience outlet known as its No. 7020 switch plug.

The Electric Machinery Manufacturing Company, Minneapolis, in order to render more effective engineering and sales service in connection with the requirements of synchronous motors, alternators, etc., in the St. Louis territory, has opened a direct factory office at 1781 Railway Exchange Building, 611 Olive Street, St. Louis, in charge of R. H. Olson. Mr. Olson was for several years sales engineer at the company's home office.

The Howard & Geeseka Company, Minneapolis, sales engineers representing various Eastern manufacturers in the distribution of electrical equipment for power plants and transmission lines, has moved from the Plymouth Building to 1008 Marquette Avenue, in order to obtain larger floor space and better facilities. This corrects an item appearing in our issue of October 4.

The Industrial Products Company, 1001 Chestnut Street, Philadelphia, is now manufacturing a "Universal safety handle" for extension cords and drop lights. It is made of rubber and is intended to slip over the socket as well as a portion of the cord.

The Blue Point Manufacturing Company, Racine, Wis., has been recently organized and incorporated by the officials of the Motor Tool Specialty Company, Chicago, and plans to equip a factory in the Sattley Building, Racine, for the manufacture of an electroplating machine, designed and patented by Peter Batenburg, former chief engineer of the Mitchell Motor Corporation, who will be associated with the Blue Point Company in an advisory capacity. The machine is to be manufactured in the size of a flatiron and is especially designed for electro repair work and the retouching of plated articles.

The Chandeysson Electric Company, 4092 Bingham Avenue, St. Louis, manufacturer of electric equipment, has awarded a general contract for the construction of a one-story addition, 50 ft. x 120 ft., to cost $50,000, including machinery and equipment.

The General Electric Company has been awarded a contract by Pickands, Mather & Company, Cleveland, for equipment for a new power house at the blast-furnace plant of the Toledo Furnace Company, Toledo, Ohio. The order includes a 10,000-kw. turbine, two 1,500-kw. motor-generator sets, four 5,000-kva. transformers, pump motors and a switchboard.

The Triumph Electric Company, Cincinnati, manufacturer of motors, has appointed the John F. Folkers Engineering Corporation, Mobile, Ala., as its agent to handle sales and service in the Mobile territory.

The Detroit Insulated Wire Company has awarded the Austin Company, engineer and builder, Detroit, a contract for a new wire-drawing building of sawtooth construction. This is the second contract which this company has awarded to Austin this year. Construction and material purchases will be handled by the Chicago office of the Austin company.

The Continental Fibre Company, manufacturer of vulcanized rubber, has awarded the Austin Company, engineer and builder, Detroit, another contract for a building at Newark, Del. The building will be used for phenolic condensation and is of two-story frame construction, 139 ft. x 280 ft. Construction and all material purchases will be handled by the Philadelphia office of the Austin company.

The Gibb Instrument Company, Bay City, Mich., manufacturer of electric welding machines and electric heating machines, has broken ground for a new modern plant.

The P. A. Geier Company, Cleveland, manufacturer of the "Royal" electric cleaner, has just distributed 433 cash and merchandise prizes which have been awarded among retail salesmen who recently participated in the sales contest conducted by the company. It is said that remarkable sales were reported by those engaged in the contest during a period when the retail appliance business has generally been accounted far below normal.

The Electric Controller & Manufacturing Company, Cleveland, has recently equipped the 50-ton crane erected on the side of the cliff at the hydraulic plant of the Niagara Falls Power Company with special dynamic braking controls, replacing the former friction brakes. It is said that with these friction brakes a heavy load which it formerly required four hours to lower a distance of 230 ft., owing to the heating of the brakes, can be handled in twenty-four minutes with dynamic braking control.

The Automatic Electric Heater Company, Warren, Pa., has been awarded the contract to furnish all the electric radiators, furnaces, etc., for the Edsel Ford two-million-dollar summer home at Seal Harbor, Maine.

The Crescent Truck Company, Lebanon, Pa., manufacturer of electrical industrial trucks, tractors and trailers, has appointed E. C. Bywater, 1997 Central Avenue, Cincinnati, as general sales agent throughout the State of Ohio.

The Connecticut Electric Manufacturing Company, Bridgeport, Conn., manufacturer of electrical wiring devices, has acquired property adjoining its plant for future expansions.

The Trumbull Electric Manufacturing Company, Plainville, Conn., recently observed the twenty-fifth anniversary of its organization. The company began manufacturing knife switches in a small way initially and now has a modern plant employing about 500 people in the manufacture of switches, panelboards, wiring devices, etc.

The Marko Storage Battery Company, 1402 Atlantic Avenue, Brooklyn, N. Y., has taken out a permit to build a two-story addition to its plant, 30 ft. x 100 ft.

The General Electric Company has awarded a general contract for the erection of a one-story building at its plant at Elmwood Avenue and Sixty-eighth Street, Philadelphia.

The B. F. Sturtevant Company, Hyde Park, Boston, manufacturer of motors, power-plant equipment, etc., has established an agency at 709 Independence Building, Charlotte, N. C., in charge of Isaac Hardeman.

The Revere Electric Company, 439 Plymouth Court, Chicago, announces the addition of a complete line of nationally known high-class radio equipment to its regular jobbing stocks and has issued a twenty-four-page radio catalog for the benefit of its customers.

The Chicago Fuse Manufacturing Company, Laflin & Fifteenth Streets, Chicago, announces the appointment of George N. Roberts as district sales manager of its New York office, succeeding J. B. Martin, who has resigned.

New Equipment Available

Line Connector

A new line connector designed specifically for use with lightning arresters but which may be used with any kind of device within its capacity of 200 amp. has been placed on the market by the General Electric Company. The connector is recommended by the manufacturer for making temporary connections in construction work where only occasional disconnecting is required and quick operation is not necessary.

The clamp is of brass throughout with the exception of the spring, which is of phosphor bronze, and the two set screws of zinc-plated steel. Only a standard disconnecting switch hook is required to operate the device. The connector can be clamped on any wire from $\frac{1}{4}$ in. to $\frac{3}{4}$ in. in diameter. A $\frac{3}{8}$-in. hole is provided for soldering a lead to the connector.

Maximum-Demand Regulator

A maximum demand regulator for reducing peaks and power demands on electric systems has been developed and placed on the market by Edward T. Moore, electrical engineer, Syracuse, N. Y. The device, which is mounted in two pressed-steel cabinets, each 14 in. x 11 in. x 4 in., can be used to limit the amount of power taken by any energy-consuming device and is especially intended for use with large loads such as electric steel-melting furnaces, annealing and heat-treating furnaces and pulp-wood grinders, as well as motors and other equipment. The regulator may be set to limit any power load to a predetermined amount, may be used for any length of demand period and may be changed as desired. A graphic meter or integrating meter may also be used in connection with the regulator.

New Trade Literature

COOLING TOWERS.—Bulletin No. 114 issued by C. F. Braun & Company, Alhambra, Cal., describes the "Braun" cooling towers and contains illustrations showing a number of installations of the towers.

SWITCHES.—The Mutual Electric & Machine Company, 7610 Joseph Campau Avenue, Detroit, is distributing a pamphlet describing and illustrating its "Bull Dog 'Luminized'" safety switch, which "adds safety to safety switches."

RESISTANCE AND OTHER WIRES.—The Gilby Wire Company, Newark, N. J., has issued its first catalog, covering the principal products of the company, including "Cromin D," "Cupron," "Monel Metal," nickel, copper and other wires.

POTHEADS.—Bulletin No. 24 issued by the G. & W. Electric Specialty Company, 7440 South Chicago Avenue, Chicago, describes the "G. & W" potheads. It also contains instructions for installing potheads and other useful information.

TIME SWITCH AND CLOCK.—The Tork Company, Inc., 8 West Fortieth Street, New York City, has published a booklet entitled "Tork Manual of Time Controls," which describes the "Tork" clock and timer and gives instructions regarding the use of the instruments and advantages of same.

HIGH-TENSION SWITCHES. — The Pacific Electric Manufacturing Company, San Francisco, has issued bulletin No. 1400, describing its line of high-tension airbrake switches.

ELECTRICAL SUPPLIES. — The Independent Electrical Supply Company, 52-54 Murray Street, New York City, has issued a new catalog containing a complete list of electrical supplies, appliances, motor-driven apparatus, radio, etc., which it carries.

INDICATING PYROMETER.—The Bristol Company, Waterbury, Conn., is distributing bulletin No. 330, covering its high-resistance "Model 420" indicating pyrometer for wall or switchboard use.

WIRING DEVICES.—The Bryant Electric Company, 1421 State Street, Bridgeport, Conn., has issued its 1924 catalog covering the "Bryant" wiring devices. It contains 204 pages, of which twenty-two pages are devoted to its "New Wrinkle" line.

AMPERE-HOUR METERS. — Bulletin No. 68 issued by the Sangamo Electric Company, Springfield, Ill., describes and illustrates its various types of ampere-hour meters, including type "N" for use with every type of storage batteries; type "NT," for motive power service; type "NF," for switchboard mounting; types "NCR" and "NCI," for railway car lighting; "NR," for radio battery service, and the "NH" house type.

WELDING ELECTRODE.—The General Electric Company, Schenectady, N. Y., has issued a booklet, known as Y-2019, describing the new type "A" General Electric welding electrode. Details are given on electrode construction and characteristics. Instructions for the use of electrodes are supplied and specifications of the standard sizes given.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

An agency is desired in Durban, South Africa (No. 11,917), for electric cables and wires.

An agency is desired in Alexandria, Egypt (No. 11,922), for lubricating oils (engine and cylinder) and yellow greases.

EQUIPMENT FOR THE BLOEMFONTEIN (SOUTH AFRICA) MUNICIPAL ELECTRIC PLANT.—Tenders will be received by the Town Council of Bloemfontein, South Africa, until Dec. 1 for equipment, etc., for the municipal electric plant as follows: (1) For material for interior and exterior power and lighting circuits at the new power station; (2) two steam turbo-generators, with condensers, circulating water and other pumps, electric motors and interconnecting piping; (3) installation of high-tension and low-tension switchgear, transformers, auxiliary motor switches, battery cable work, etc.; furnishing and erecting boiler house equipment (contract No. 2); coal and ash-handling equipment, with capstans, etc. (contract No. 6).

ELECTRICAL EQUIPMENT FOR BOMBAY (INDIA) SUBURBAN RAILWAYS.—Tenders will be received by S. G. S. Young, secretary of the Bombay, Baroda & Central India Railway Company, White Mansion, 91 Petty France, Westminster, S. W. 1, London, England, until Dec. 15 for electric equipment of coaches in connection with the electrification of the Bombay suburban lines of the above company. Merz & McLellan, 32 Victoria Street, Westminster, S. W. 1, London, are consulting engineers.

New Incorporations

THE MOUNTAIN GROVE (MO.) POWER COMPANY has been incorporated with a capital stock of $10,000 by R. D. Alexander, 1,089 South Boulevard, Springfield, Mo.; W. M. Williams and L. H. Williams, both of Mountain Grove.

THE FRANKSTON (TEX.) ELECTRIC LIGHT & POWER COMPANY has been incorporated by J. R. Hughes, D. L. Hugon and E. P. Miller.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

LOWELL, MASS.—The Mayor has approved the action of the Board of Public Service regarding the installation of sixty-one ornamental lamps in the downtown business section. The lamps will be installed by the Lowell Electric Light Corporation.

READING, MASS.—Two propositions are under consideration to increase the supply of electricity for the town of Reading. One is to increase the output of the municipal electric plant, at a cost of about $80,000; the other to connect with some outside source of power and to purchase energy, for which about $100,000 will be required.

Middle Atlantic States

BUFFALO, N. Y.—The Department of Public Works is considering the installation of an improved lighting system on Clinton Street.

CASTLETON, N. Y. — The Schodack Electric Light & Power Company has been authorized to extend its service into the hamlet of Brookview.

CHAMPLAIN, N. Y.—The Champlain Electric Company has been granted permission to extend its transmission lines in the town of Champlain. It is proposed to extend the lines by three routes.

FORT COVINGTON, N. Y.—The Fort Covington Light, Heat & Power Company has applied to the Public Service Commission for permission to construct an electric distributing system in Newfield and for approval of franchise granted by the Town Board.

ITHACA, N. Y.—The Public Service Commission has approved franchises permitting the New York Gas & Electric Corporation to extend its transmission lines to furnish electricity in nine towns in central and southeastern New York, including Marshall, Fallsburgh, Hamilton, Kirkland, Moravia, Locke, Neversink and Stamford.

LAWRENCEVILLE, N. Y.—Steps have been taken by the merchants along Central Avenue to install an ornamental lighting system on that thoroughfare. The cost of erecting the lamps from Washington Avenue to Rockaway Turnpike is estimated at $6,500.

NEW YORK, N. Y.—The Bronx Gas & Electric Company has filed plans for the construction of a substation, at Westchester Avenue and St. Peter's Street, to cost about $50,000. W. W. Knowles, Electric Building, Long Island City, is architect.

ROCHESTER, N. Y.—The City Council is reported to be considering extensions to the street-lighting system in the Twenty-second ward and Culver Road. C. A. Poole is city engineer.

SCIO, N. Y.—The Genesee Valley Power Company, Fillmore, has been granted permission to extend its lines to Scio and install an electric distributing system here.

SYRACUSE, N. Y.—The Syracuse Lighting Company is planning to extend its transmission lines from Central Square along the north shore of Oneida Lake to supply electricity to the villages of Constantia, Bernhards Bay, Cleveland and intervening territory. An appropriation has been voted for street lighting in Cleveland, and it is expected that funds will be provided for street lamps in Constantia.

ELIZABETH, N. J.—The Board of Public Works has authorized the Public Service Electric Company, Newark, to install seventy-eight 400-cp. lamps on Elizabeth Avenue between Third and Eleventh Streets.

MARGATE CITY, N. J.—The City Commissioners are considering the installation of an ornamental lighting system on Ventnor and Atlantic Avenues, to cost about $60,000. The Atlantic City (N. J.) furnishes street-lighting service here. Margate City has not a post office.

CHAMBERSBURG, PA. — The Franklin Transmission Company, recently organized, plans to take over and consolidate five electric light and power companies in Franklin County. Extensions to transmission lines are under consideration.

PHILADELPHIA, PA.—Plans are under consideration by the Fifty-second Street Allied Business Association for establishing an ornamental lighting system on Fifty-second Street, from Spruce to Vine Street, in West Philadelphia.

PHILADELPHIA, PA.—The committee in charge of the Sesqui-Centennial celebration is planning a large scheme for lighting the main arteries of the city, which will be continued indefinitely after the demonstration is over. Under the proposed program more than 500 city blocks will be decorated with ornamental lamps. It is proposed to use part of the lamp standards for guideposts as well as for illuminating purposes. The plans provide for the use of uniform lamp posts throughout the city.

NEWCASTLE, DEL. — The Penn-Seaboard Steel Corporation, Franklin Bank Building, it is reported, is planning to install electric power equipment in connection with a proposed strip, bar and wire mill, to cost about $250,000.

AMHERST, VA.—The proposal to issue $79,000 in bonds will be submitted to the voters at the general election Nov. 4, of which $49,000 will be used for the construction of a municipal electric plant.

CLIFTON FORGE, VA.—The Virginia-Western Power Company plans to build a steel tower, 120,000-volt transmission line from Ronceverte, W. Va., to Clifton Forge, to cost about $800,000. Francis R. Weller, Hibbs Building, Washington, D. C., is consulting engineer.

MONTVALE, VA. — The Montvale-Thaxton Transmission Company contemplates the erection of a 6,600-volt transmission line from Montvale to Blue Ridge Springs, a distance of 5½ miles.

WASHINGTON, D. C.—Bids will be received by the Board of Commissioners, District of Columbia, until Oct. 28, for cast-iron lamp posts and accessories for fire alarm and police patrol boxes, including fifty lamp-post bases, twenty-five telescope boxes for fire-alarm posts and twenty telescope boxes for police-patrol posts.

WASHINGTON, D. C.—Bids will be received by the office of the chief of engineers, United States Army, until Oct. 31, for 2,000 weatherproof porcelain lamp receptacles (Circular 5).

North Central States

BOYNE FALLS, MICH. — The Boyne Falls Light & Power Company, recently organized, plans to erect a transmission line. Ernest L. Schultz and J. M. Harris head the company.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until Nov. 7 for electric street lighting.

COLUMBUS, OHIO. — Steps have been taken by the South Side Civic Association for the installation of an ornamental lighting system on South High Street, south of Livingston Avenue. It is proposed to use incandescent filament units.

LISBON, OHIO.—The East Ohio Power & Light Company, Youngstown, contemplates important changes in the Lisbon and Leetonia systems before July 1, 1925. C. M. England is local manager.

BLOUNTSVILLE, IND. — The Town Council has plans under way for the installation of an electric lighting system.

GARY, IND.—The Calumet Gas & Electric Company has been granted permission to take over fourteen public utility properties in the section. The company has applied for permission to issue $2,500,000 in bonds and $2,460,000 in capital stock, the proceeds to be used in connection with the acquisition of properties and for proposed extensions and betterments.

CHICAGO, ILL.—The City Council has passed an ordinance providing for a special election in conjunction with the general November election through which the proposals to issue $4,000,000 in bonds for expansion of the municipal street-lighting system will be submitted to the voters. The work would include the replacement of 8,000 tungsten lamps of 100 cp., erected in 1911 on gas-lamp posts, by 4,000 lamps of 250 cp. on concrete standards, to cost $150,000; the construction of a new substation to supplant both the Thirty-ninth Street and Wentworth Avenue substations, $75,000; erection of new substation to care for additional territory to be lighted in outlying districts, $75,000; for rehabilitation of old aerial circuit equipment in various wards, $500,000; for new extensions in the lighting system in developed districts in the outlying wards, $2,500,000.

ALMA, WIS.—The installation of an ornamental lighting system in the downtown section of the city is under consideration by the City Council.

BARRON, WIS.—The installation of a new electric generating unit in the municipal electric light plant is under consideration by the Council.

BEAVER DAM, WIS.—Plans have been prepared by the Wisconsin Power & Light Company, Madison, for the erection of a new transmission line from Beaver Dam to Horicon, a distance of about 11 miles. The cost is estimated at $30,000.

HAYWARD, WIS.—The Northern States Power Company, Galena, Ill., contemplates extensions and improvements to its power plant and dam on the Chippewa River, near Hayward, to cost about $60,000.

MADISON, WIS.—Plans have been approved by the State Board of Control for new buildings at the state tubercular camp at Tomahawk Lake, to cost about $100,000, of which $3,500 will be used for extension to the power house.

MERRILL, WIS.—Plans providing for extension of the ornamental lighting system on Poplar Street, to extend from Main Street, have been approved by the City Council. A new lighting system will be installed at Riverside Park.

WITTENBERG, WIS. — The Wittenberg Light & Power Company has acquired the properties of the Leopolis (Wis.) Light & Power Company, which consists of 22 miles of transmission lines supplying electricity to Leopolis, Pella, Tilleda and intervening rural communities. The new owner plans to erect a transmission line about 25 miles long, to connect the Leopolis and the Wittenberg systems to furnish these communities with a twenty-four-hour service.

FARIBAULT, MINN.—The City Council has retained Arthur L. Mullergren, Gates Building, Kansas City, Mo., consulting engineer, to make a complete report for a municipal electric light and central heating plant and electric distribution system. The cost of the entire project is estimated at $450,000. S. M. Andrews is city recorder.

FARIBAULT, MINN.—The State Board of Control has completed plans for a power plant at the local State School for Feeble-Minded, to cost about $35,000. C. B. Johnston, Capital Bank Building, St. Paul, is architect.

HIBBING, MINN.—The installation of an ornamental lighting system on Howard Street is under consideration.

CAPLINGER MILLS, MO. — The West Missouri Power Company, Pleasant Hill, has started work on the foundation for its proposed new local power plant.

MOUNTAIN GROVE, MO.—The Mountain Grove Power Company, recently incorporated, plans to install an electric plant, to cost about $75,000. The Alexander Engineering Company, Woodruff Building, Springfield, is engineer.

POPLAR BLUFF, MO.—Plans are under way by M. H. Meredith, Poplar Bluff, Mo., and associates, to organize a company to construct and operate a hydro-electric plant on the Black River, to develop about 10,000 hp., to be used for land reclamation and other service in the vicinity of Poplar Bluff. Isham Randolph & Company, 208 South La Salle Street, Chicago, consulting engineers, have been retained to prepare plans.

BRIDGEPORT, NEB.—The installation of a municipal electric light and power plant is under consideration by the Town Council.

Southern States

ASHEVILLE, N. C.—The North Carolina Electrical Power Company has tentative plans for doubling the capacity of its local steam-operated electric station.

ASHEVILLE, N. C. — The Asheville Power & Light Company has acquired a site on the Big Pigeon River, about 40 miles from the city, and contemplates the construction of a hydro-electric plant. The plans include a dam 170 ft. high and a transmission line.

FRANKLIN, N. C.—Bonds to the amount of $300,000 have been authorized by the city for the construction of a hydro-electric power plant on Little Tennessee River, to develop from 2,000 hp. to 3,000 hp.

ATLANTA, GA.—The Georgia Railway & Electric Company is considering a bond issue of $578,000, part of the proceeds to be used for extensions and improvements.

FROSTPROOF, FLA.—At an election to be held Nov. 17 the proposal to issue bonds for the installation of waterworks, ornamental lighting system, sewerage system, etc., will be submitted to the voters.

STUART, FLA.—Plans are being considered by the Southern Utilities Company for rebuilding and enlarging its local plant.

BIRMINGHAM, ALA.—Under two separate orders the Alabama Power Company, Birmingham, is granted permission to extend its service to nine Alabama towns. One of the orders grants the company a certificate of convenience and necessity for the erection of an electric transmission line from Selma via Uniontown and Faunsdale to Demopolis. The other authorizes the construction of a transmission line to connect with the company's line to be erected from Hangood to Decatur and a distribution system at Leighton Town Creek, Hillsboro, Trinity, Cherokee and Courtland.

MEMPHIS, TENN.—Bids will be received by the Mississippi River Commission, First and Second Districts, until Oct. 29 for two 25-hp. motors, induction type, three-phase, 60-cycle, 220 volts, operating at 1,750 r.p.m., with starting compensator, etc.

EARLE, ARK.—The Earle Light, Water & Ice Company contemplates extensions and improvements to its system.

BRAMAN, OKLA.—Bonds to the amount of $25,000 have been voted for the erection of a 13,200-volt transmission line from Braman to Blackwell, a distance of 10 miles, and an electric distribution system in Braman. F. B. King, Grain Exchange Building, Oklahoma City, is engineer.

OKMULGEE, OKLA. — The Oklahoma Power Company has acquired a site at the crossing of the North Canadian River by the Frisco railroad, a short distance south of Weleetka, on which it proposes to build a power plant.

DALLAS, TEX.—The Dallas Power & Light Company has taken out a permit to build a substation at 115 South Tyler Street, to cost about $60,000.

DALLAS, TEX.—The Texas Interurban Railway Company is reported to be negotiating with the Gulf, Colorado & Santa Fé Railroad for the electrification of its division between Dallas and Cleburne, a distance of 53 miles, for operation as an interurban line.

FRANKSTON, TEX. — The Frankston Electric Light & Power Company, recently organized, contemplates the erection of a transmission line to supply electricity for local service. J. R. Hughes and E. P. Miller head the company.

MARBLE FALLS, TEX. — The Marble Falls Textile Mills, Inc., recently formed with a capital of $750,000, contemplates the construction of a hydro-electric plant in connection with its proposed cotton mill. A site on the Colorado River has been selected.

Pacific and Mountain States

CLEAR LAKE, WASH.—The Clear Lake Lumber Company will install within the next sixty to ninety days an additional 3,200-kw., three-phase, 60-cycle, 440-volt turbine and an 800-hp. Stirling boiler. At present the company is purchasing power (2,000 kw.) from the Puget Sound Power & Light Company. E. J. Clarke is purchasing agent.

TACOMA, WASH.—The City Council has passed a resolution providing for the installation of an ornamental lighting system on a number of streets, including North Jurnett Street.

VANCOUVER, WASH. — The Commissioners of Clarke County have granted the Northwestern Electric Company, Portland, Ore., permission to erect transmission lines along the roads of Clarke County.

COTTONWOOD, CAL.—A site has been acquired at Panorama Point, a mile from Cottonwood, by the Pacific Gas & Electric Company, San Francisco, on which it proposes to erect a substation for stepping up electricity received from the Copco plant of the California-Oregon Power Company at 110,000 volts to 220,000 volts, to be turned into the high-voltage line from Pit No. 1 to Vacaville. The company is planning to erect a 110,000-volt line immediately from Cottonwood to the Delta connection, a distance of 35 miles.

LONG BEACH, CAL.—The City Council is considering the installation of a fire-alarm system in recently annexed sections to be carried out in connection with a proposed bond issue of $700,000 for municipal improvements.

LOS ANGELES, CAL.—Bids will be received by the Public Service Commission until Oct. 31, for three 10,000-kva. transformers (Specification P-313).

LOS ANGELES, CAL.—The Board of County Supervisors is asking bids for the installation of an ornamental street-lighting system in the West Hollywood Lighting District, also for the installation of a similar system in the Graham Lighting District.

OROVILLE, CAL.—Plans for the proposed power plant to be built by the Feather River Power Company at Bean Creek, 24 miles from Oroville, to develop 80,000 hp., include a 200-ft. dam in the Bull Rock Canyon, 5 miles of tunnel and a generating plant.

SAN FRANCISCO, CAL. — Plans are under consideration by the Crocker Estate Company, Crocker Building, to establish a residential tract and town site, including waterworks, sewer and lighting systems, to cost from $500,000 to $850,000. F. Heding, Crocker Building, is engineer.

VERNAL, UTAH.—The Utah Power & Light Company, Salt Lake City, has filed application with the State Engineer for water rights on the Green River for the development of 110,000 hp. The company proposes to utilize the Split Mountain district about 15 miles east of Vernal. The present plans provide for a dam 225 ft. high creating a reservoir with a capacity of 200,000 acre-feet and to divert the water through a tunnel 24 ft. in diameter, 4,000 ft. long, to the proposed power site, which is located several miles down the stream.

LARAMIE, WYO.—The Board of Trustees, State University of Wyoming, plans to build an electric power plant at the institution. The equipment will include two generating units and accessory equipment.

Canada

VANCOUVER, B. C. — The British Columbia Electric Railway Company contemplates extensions to its light and power lines, covering a distance of 7½ miles, in the Bay Ridge district.

HAWKESBURY, ONT.—Plans are under consideration by the Ottawa-Montreal Power Company, Ltd., Keefer Building, Montreal, for the erection of a 10,500-volt transmission line to Alfred, to cost about $15,000.

JONQUIERE, QUE.—The City Council is reported to be considering the erection of a 13,200-volt transmission line, 20 miles long.

THREE RIVERS, QUE. — The International Paper Company, 100 East Forty-second Street, New York, plans to install electric power equipment in the proposed addition to its local news-print mill, to cost about $5,000,000.

Electrical Patents

Announced by U. S. Patent Office

(Issued September 9, 1924)

1,508,236. CONTROL APPARATUS AND SYSTEM; H. D. Murdock, Wilkinsburg, Pa. App. filed Feb. 19, 1921. Motor-control systems of relatively high voltage.

1,508,237. CONTROL APPARATUS AND SYSTEM; H. D. Murdock, Wilkinsburg, Pa. App. filed Oct. 7, 1921. Employing a relay having a plurality of oppositely wound coils to govern the closure of a line switch, the energization of the coils of the relay device being selectively governed by means of a switching device that is associated with a master controller.

1,508,241. METAL AND ITS MANUFACTURE; A. Pacz, Cleveland, Ohio. App. filed Feb. 15, 1922. For the production of tungsten wire that will not elongate or sag readily.

1,508,250. INSULATOR; K. C. Randall, Edgewood Park, Pa. App. filed Dec. 14, 1918. For busbar support.

1,508,251. DYNAMO-ELECTRIC MACHINE; H. G. Reist and E. S. Henningsen, Schenectady, N. Y. App. filed Oct. 30, 1922. With double-winding rotor.

1,508,256. TROLLEY-CONDUCTOR HANGER; W. Schaake, Pittsburgh, Pa. App. filed Feb. 4, 1921.

1,508,262. IGNITION GENERATOR; A. P. Young, Kenilworth, England. App. filed July 26, 1920. Magneto type.

1,508,302. INCANDESCENT LAMP; C. C. Schnur, Toronto, Ontario, Canada. App. filed Sept. 22, 1922. Filament mounting.

1,508,310. TELEPHONE MOUTHPIECE; F. L. Van Houte, The Hague, Netherlands. App. filed Aug. 28, 1923. With soundproof speaking chamber.

1,508,353. ENGINE-TESTING DEVICE; C. F. Scott, Yonkers, N. Y. App. filed June 20, 1921. Dynamometer.

1,508,354. ELECTRIC WAVE FILTER; E. O. Scriven, New York, N. Y. App. filed July 14, 1917.

1,508,356. ELECTRON DISCHARGE DEVICE; W. C. White, Schenectady, N. Y. App. filed Feb. 18, 1920. Wireless receiving circuit.

1,508,360, 1,508,363. ELECTRICAL METHOD AND APPARATUS; R. N. Conwell, Bloomfield, N. J. App. filed May 11, 1921. Alternating-current relay.

1,508,364. POWER SYSTEM; J. D. Hilliard, Schenectady, N. Y. App. filed Sept. 18, 1923. Sleet protection for lines.

1,508,368. DIRECTION SIGNAL LAMP FOR AUTOMOBILES; J. D. Hendrix, Seattle, Wash. App. filed July 18, 1923.

1,508,371. PROCESS OF PRESERVING BATTERIES; L. Krieger, Paris, France. App. filed Feb. 19, 1924. Dry-cell type.

1,508,373. CONNECTOR; E. N. Lightfoot, New York, N. Y. App. filed Jan. 17, 1921. Adapted to join two tubular electric heaters end to end.

1,508,374. ELECTRIC MUFFLE FURNACE; I. R. Valentine, Erie, Pa. App. filed Oct. 13, 1920. Resistance type.

(Issued September 16, 1924)

1,508,377. COMBINED REGULATOR AND FUSE FOR GENERATORS; Fred Allison, Highland Park, Mich. App. filed May 19, 1921. Used in connection with the ignition systems of automobiles.

1,508,391. RETARDATION DEVICE; Talma T. Greenwood, Templeton, Mass. App. filed May 5, 1920. As used in time-limit devices.

1,508,402. RENEWABLE FUSE PLUG; Sylvester Kubiak, Chicago, Ill. App. filed Oct. 23, 1922.

1,508,404. TELEPHONE-EXCHANGE SYSTEM; Alben E. Lundell, New York, N. Y. App. filed July 14, 1917. Indicates to the operator the number of the telephone line.

1,508,414. SWITCHING APPARATUS; William M. Scott, Tredyffrin Township, Chester County, Pa. App. filed Jan. 23, 1920. Automatic circuit-breaker mechanism.

1,508,424. TELEPHONE DESK SET; George K. Thompson, Maplewood, N. J. App. filed Dec. 28, 1922. Automatic type.

1,508,425. TELEPHONE PRIVATE BRANCH EXCHANGE CIRCUITS; John F. Toomey and Henry E. Phelps, New York, N. Y. App. filed July 7, 1921.

1,508,427. ELECTRIC STORAGE-BATTERY CONSTRUCTION; Hugo G. Wagner, Point Pleasant Beach, N. J. App. filed Dec. 27, 1921.

1,508,428. ELECTRIC STORAGE-BATTERY CELL AND CASE; Hugo G. Wagner, Point Pleasant Beach, N. J. App. filed July 13, 1922. Especially designed for use with interlocking grids.

1,508,432. SOUND RECORDING AND REPRODUCING APPARATUS; Harry B. Wier, Plainfield, N. J. App. filed Nov. 18, 1921.

1,508,452. ELECTRICALLY HEATED RECEPTACLE AND HOT PLATE; Alfred L. Harrington, Rosslyn Farms, Pa. App. filed March 23, 1923. For use in the paint or varnish industry.

1,508,456. GROUND CLAMP; William G. Lenz, Brooklyn, N. Y. App. filed Jan. 4, 1924. Made of a spring coil.

1,508,474. ELECTRICAL ATTACHMENT PLUG; Leopold Pollock, New York, N. Y. App. filed April 24, 1919.

1,508,486. DEVICE FOR INTRODUCTION OF THE ELECTRODES IN ELECTRIC FURNACES; Filip Thoraldsen, Christiania, Norway. App. filed Sept. 6, 1922.

1,508,490. ELECTRIC HEATING DEVICE; George A. Wiechert, Howard Beach, N. Y., and Jesse E. Judd, New York, N. Y. App. filed May 16, 1923. For melting precious metals in small quantities.

1,508,508. WASHING-MACHINE MECHANISM; James W. Dawson, Belvidere, Ill. App. filed Jan. 4, 1924.

1,508,544. AUTOMATIC SYNCHRONOUS RECTIFYING MECHANISM; Fritz W. Falck, Los Angeles, Cal. App. filed Jan. 31, 1921.

1,508,565. LOADING SYSTEM; John Mills, Wyoming, N. J. App. filed March 29, 1923. For the transmission of voice currents.

1,508,597. VACUUM CLEANER; George Clements, Chicago. App. filed Aug. 4, 1921. Suction-nozzle construction.

1,508,611. BURGLAR ALARM; Anthony J. Parissi, Cohoes, N. Y. App. filed Nov. 5, 1920. Control for electrically operated alarm.

1,508,613. NEGATIVE PLATE FOR ELECTRIC ACCUMULATORS; Adolfo Pouchain, Turin, Italy. App. filed Aug. 18, 1920. Method of manufacture in which the zinc is deposited on a plate of silver or of another metal covered with silver.

1,508,615. CRYSTAL DETECTOR FOR RADIO APPARATUS; Eugene C. Rowley, Seattle, Wash. App. filed Dec. 27, 1922. With multi-wire "cat's whisker."

1,508,622. SPARK-AMPLIFYING DEVICE; Rensselaer J. Smith, South Bethlehem, N. Y. App. filed April 21, 1921. For ignition system.

1,508,647. VARIABLE CONDENSER; John W. Cornelius, Kingman, Ariz. App. filed Sept. 18, 1923. As used in radio apparatus.

1,508,666. ELECTRIC BOX; Edward Niederman, Norwich, Conn., and Morris J. Krinsky, New York, N. Y. App. filed Aug. 9, 1920. Outlet box with provision for clamping cable.

1,508,681. SOUND-REPRODUCING MACHINE; Leon F. Douglass, San Rafael, Cal. App. filed April 24, 1916. Using the sound waves to cause variations in an electric circuit and transforming back to secondary sound waves which may be easily varied as to volume.

1,508,688. CONTROL SYSTEM FOR AUTOMATIC ARC-WELDING APPARATUS; Charles E. Glasser, Schenectady, N. Y. App. filed Sept. 12, 1921. With the arc maintained at substantially constant length.

1,508,689. METALLIC ARC WELDING; Charles E. Glasser, Schenectady, N. Y. App. filed Sept. 23, 1921. Automatic electrode feed.

1,508,690. WELDING MACHINE; Charles E. Glasser, Schenectady, N. Y. App. filed Nov. 11, 1922. Automatic arc-welding machine with means provided to oscillate the welding electrode as it is automatically fed.

1,508,691. ELECTRIC-ARC WELDING; Charles E. Glasser, Schenectady, N. Y. App. filed May 15, 1923. For producing circular welds by the automatic metallic electrode electric-arc-welding process.

1,508,700. PROTECTING DEVICE; Charles F. Kettering, Dayton, Ohio. App. filed Mar. 26, 1917. For ventilating projections on flywheel of farm lighting plant.

1,508,701. HAND-OPERATED ARC-WELDING APPARATUS; Christian Kramer, Berlin-Pankow, Germany. App. filed May 13, 1922. With electric motor-operated electrode feed through flexible shaft.

1,508,710. ELECTRIC ARC-WELDING SYSTEM AND APPARATUS; Paul O. Noble, Schenectady, N. Y. App. filed April 26, 1920. Automatic metallic arc welding on articles varying greatly in size and shape.

1,508,711, 1,508,712. ARC WELDING; Paul O. Noble, Schenectady, N. Y. App. filed Feb. 16, 1922. Using automatic electrode feed to maintain the arc at substantially constant length.

1,508,713. ARC-WELDING APPARATUS; Paul O. Noble, Schenectady, N. Y. App. filed March 24, 1923. For circular welds.

1,508,726. RADIO PHONOGRAPH; Israel Shapiro, Denver, Col. App. filed May 29, 1923. Combined radio and phonograph.

1,508,732. STORAGE BATTERY; Fred C. Thornley and Frank F. Tapping, Knightsbridge, London, England, and Otto Reynard, Inkerman Terrace, London, England. App. filed July 21, 1923. Method of plate manufacture.

1,508,735. ELECTRIC HAIR DRYER; Theobald C. Weiss, Racine, Wis. App. filed Dec. 6, 1921.

1,508,738. METHOD OF AND APPARATUS FOR AUTOMATIC ARC WELDING; Max A. Whiting, Schenectady, N. Y. App. filed Feb. 15, 1919. By a metallic electrode.

1,508,742. ELECTRIC ARC WELDING; Eugene R. Carichoff, Schenectady, N. Y. App. filed Dec. 14, 1923. Circuit-controlling mechanism to control the striking of the arc automatically.

1,508,743. SIGNAL BOX; Ralph W. Carnahan, Canton, Ohio. App. filed April 15, 1919. Fire-alarm type; motive power supplied by a sliding rack operated by a weight.

1,508,744. SUPPORTING BASE FOR RELAYS OR OTHER ELECTRICAL UNITS; John O. Carr and Howard L. Krum, Chicago, Ill. App. filed June 8, 1921. With connection terminals.

1,508,746. AUTOMATIC ARC-WELDING CONTROL SYSTEM; William B. Clarkson, Schenectady, N. Y. App. filed Dec. 22, 1923.

1,508,758. ELECTROLYTIC APPARATUS; William G. Allan, Toronto, Ontario, Canada. App. filed Feb. 3, 1920. For the electrolysis of water.

1,508,765. PLURAL LAMP SOCKET; Reuben B. Benjamin, Chicago, Ill. App. filed April 23, 1919.

1,508,766. ELECTRICAL CONNECTOR DEVICE; Reuben B. Benjamin, Chicago, Ill., and Chester E. Warner, Berwyn, Ill. App. filed May 10, 1920. Plug cluster.

1,508,767. PLUG CLUSTER; Reuben B. Benjamin, Chicago, Ill., and Chester E. Warner, Berwyn, Ill. App. filed May 18, 1921. Can be used in combination with a shade.

1,508,770. SYSTEM OF MOTOR CONTROL; Harold L. Blood, Plainfield, N. J. App. filed Nov. 8, 1920. For alternately operating a pair of electric motors.

1,508,776. STORAGE-BATTERY PLATE; Thomas R. Cook, Pittsburgh, Pa. App. filed Aug. 10, 1920. With specially constructed positive and negative grids.

1,508,796. SYSTEM FOR ADJUSTING AT A DISTANCE GUNS, SEARCHLIGHTS OR OTHER APPARATUS; Paul Kaminski, Berlin-Pankow, Germany. App. filed May 12, 1921.

1,508,798. KEY; Albert Klay, Chicago, Ill. App. filed Aug. 23, 1920. Ringing and listening telephone key.

1,508,799. STERILIZER; Robert E. Klett, Ridgefield Park, N. J. App. filed Sept. 23, 1922.

1,508,827. DRIVING MECHANISM FOR PHONOGRAPHS; Louis P. Valiquet, Chicago, Ill. App. filed Sept. 4, 1923.

1,508,829. ELECTROLYTE-LEVEL INDICATOR FOR STORAGE BATTERIES; Joseph L. Woodbridge, Philadelphia, Pa. App. filed Oct. 31, 1922.

1,508,847. COVER SEAL FOR STORAGE BATTERIES; Helen C. Gillette, Elmhurst, N. Y. App. filed Nov. 8, 1921.

1,508,870. ELECTRICALLY OPERATED TELEGRAPHIC TYPEWRITING SYSTEM; Orin Bennett, San Francisco, Cal. App. filed May 27, 1922.

1,508,884. SIGNALING DEVICE; George Jacobs, Detroit, Mich. App. filed Jan. 15, 1921. For motor vehicles.

1,508,893. CRYSTAL DETECTOR FOR RADIO RECEPTION; Frederick G. Mitchell, Ridgefield Park, N. J. App. filed June 24, 1922.

1,508,926. STORAGE-BATTERY-CELL COVER; Thomas R. Cook, Pittsburgh, Pa. App. filed Oct. 8, 1921.

1,508,943. FUEL-PREHEATING ATTACHMENT FOR INTERNAL-COMBUSTION ENGINES; Louis T. Sicka, Bonne Terre, Miss. App. filed Jan. 2, 1923.

1,508,945. GENERATOR DRIVE; Henry M. Ainsworth, Coventry, England. App. filed Sept. 20, 1921. Combined dynamo and starting motor on motor vehicles.

1,508,955. DIRECTION SIGNAL FOR MOTOR VEHICLES; Charles R. Bryan, New York, N. Y. App. filed Sept. 23, 1921.

1,508,982. ELECTRIC WATER HEATER; James A. MacDonald, Brantford, Ontario, Canada. App. filed Sept. 28, 1922. For domestic hot-water boiler.

1,508,987. BATTERY OF DRY CELLS AND PROCESS OF ASSEMBLYING THE SAME; Carl S. Rider, Lansing Mich., and Alton K. Huntley, Madison, Wis. App. filed March 11, 1922. Flat type.

1,508,990. FLASHLIGHT ATTACHMENT; Frederick J. Schmidt, Steelton, Pa. App. filed Sept. 25, 1922. Flashlight having an extension cord attachment with battery external to case.